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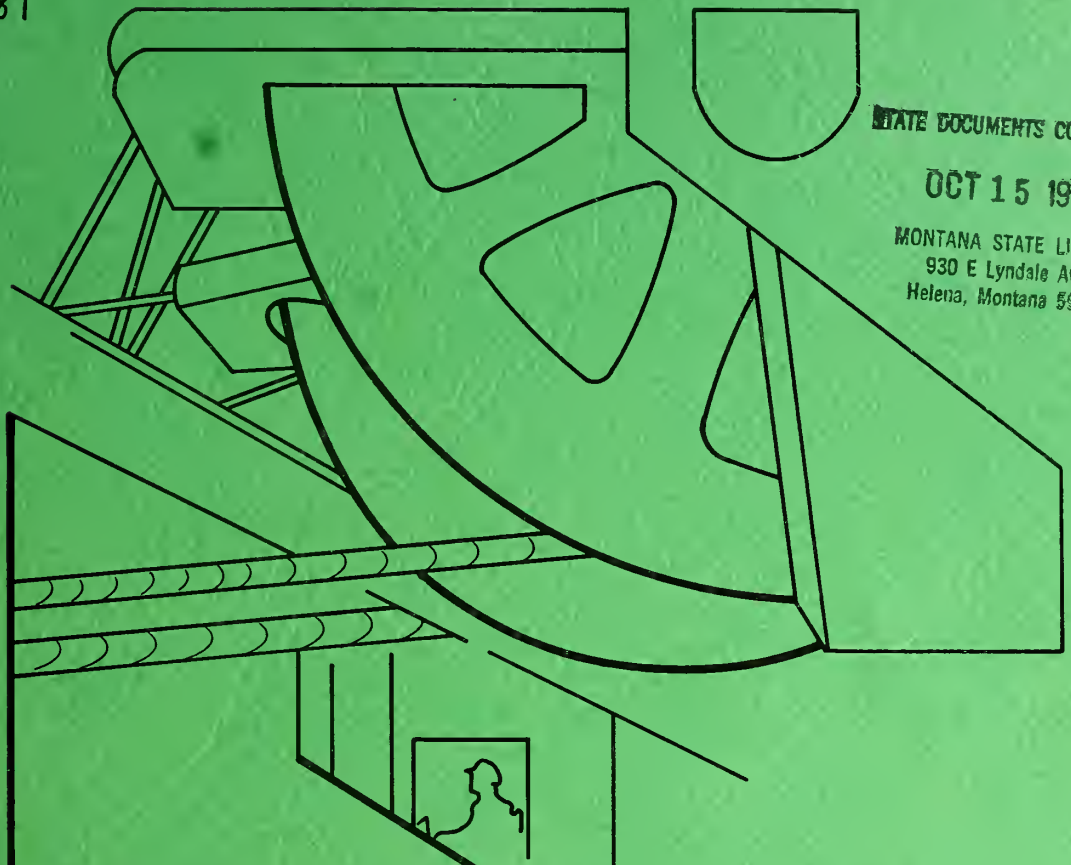

FINAL

Western Energy Company's
Rosebud Mine — Area E Extension

ENVIRONMENTAL IMPACT STATEMENT

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Final Environmental Impact Statement

Western Energy Company's Rosebud Mine, Area E Extension

Rosebud County, Montana

Montana Department of State Lands

August, 1981

Gareth Moon, Commissioner

SUMMARY

1. Action under consideration: Western Energy Company proposes to extend Area E of its Rosebud mine into sections 2 and 11, T. 1 N., R. 41 E. The extension would require an amendment of Western Energy's existing strip mining permit. The Commissioner of State Lands must decide whether to (1) approve the permit amendment or portions of the amendment as proposed, (2) approve the permit with stipulations, or (3) deny the amendment or portions of the amendment.

2. Brief description of the company's proposal: Western Energy proposes to mine 276 acres of its existing Federal and private coal leases in Area E through 1984. An additional 174 acres would be used for haul roads, topsoil stockpiles, and a highwall reduction area. Annual coal production would remain at about the current rate of 3 million tons/year. The proposed plan would complete Western Energy's mining operations in Area E. Active reclamation of disturbed areas would continue at least until 1987.

3. Summary of impacts by discipline:

Geology--impacts on topography and geomorphology would not be significant because the company's proposed mine plan would minimize erosion over the long term. Erosion on the reclaimed minesite would at first be higher than on most native range lands near Colstrip, but erosion rates are expected to approach premining levels within 3-4 years after revegetation.

Hydrology--impacts on hydrology would be significant because continued mining would add saline water to the headwaters of Cow Creek and to bedrock aquifers downgradient of the mine. The saline water could slightly reduce the productivity of irrigated fields and native rangeland east of Area E over the long term. Salts also could reduce the quality of water in shallow bedrock aquifers near the mine (which could be developed for stock water), perhaps to the point of being unsuitable. Selective placement of overburden may be a method of minimizing these hydrologic impacts.

Climate--continued mining in Area E would have no significant impact on the climate. The fugitive emission sources are all at ground level and the emission rates are not of sufficient magnitude to affect either precipitation or radiation balance.

Air Quality--particulate and gaseous emissions from Area E would continue to contribute slightly to the significantly reduced air quality at Colstrip. Increases in ambient particulate and gaseous pollutant concentrations would be primarily caused by construction of Colstrip units 3 and 4, not continued mining in Area E.

Soils--impacts on soils would not be significant because the proposed soil salvage plan and complex slope system would prevent excessive loss of soil during and after mining.

Vegetation--impacts on vegetation would not be significant because Western Energy would make maximum feasible use of the reclaimed soil's potential to support diverse native vegetation. Unavoidable disturbance of the soil would probably cause a slight reduction in potential productivity, but this would not limit normal use of the reclaimed minesite for domestic livestock production and wildlife habitat.

Wildlife--continued mining at Area E would not have significant long term impacts on wildlife because Western Energy would reestablish wildlife habitats similar to those that existed before mining.

Sociology--continued mining in Area E would contribute a small amount to the continuation of existing social impacts in the Colstrip-Forsyth area, but would not measurably affect the social structure of the Colstrip-Forsyth area. This is so because the mine employees and their families are already residents, and because the mine would not cause further population growth.

Economics--approval of the Area E extension would not have a significant adverse economic impact because the mine is an existing operation that provides a tax base for Rosebud County and the two Colstrip school districts.

Community Services--continued mining in Area E would not increase the need for community services in Rosebud County. Services and facilities provided in response to construction of Colstrip generating units 1 and 2 are generally adequate for the population attributable to Area E.

Land Use--the Area E extension would not signficantly affect land use in Rosebud County, because mining the 410 acres of rangeland would temporarily reduce available grazing land in Rosebud County by only 0.02 percent. If managed properly by the landowner or grazing lessee, the reclaimed mine area would be about as productive as it was in 1975, the last year it was grazed.

Transportation--the Area E extension would not contribute significantly to the existing highway safety problems and occasional traffic delays from coal trains in the Colstrip-Forsyth area. Improvements to FAP 39 projected to be completed by 1982 should greatly alleviate both problems.

Recreation--continued mining at Area E would not significantly increase demands on developed recreation facilities or undeveloped recreation areas. The minesite itself is not a significant recreation resource.

Cultural Resources--the loss of six archeological sites and one historic site would not be significant because none are eligible for inclusion on the National Register of Historic Places. None of the sites are unusual for the northern Great Plains, and none provide important information about prehistory or recent history.

Esthetics--long term esthetic impacts would not be significant because the minesite's esthetic value, which is not distinctive for the region, would be largely restored after mining.

4. Relationship between short term uses of the environment and long term productivity:

The 11.2 million tons of coal mined from the Area E extension would be burned in Colstrip electric generating units 1 and 2. This short term use of the minesite would last through 1984, when mining in Area E would end. If the mine area were not disturbed, it would continue to provide livestock forage, wildlife habitat, and limited scenery. Those uses would be restored after reclamation without a long term reduction in productivity, compared with the premining (1975) condition. Disruption of the minesite's hydrologic function could be significant: degradation of ground water quality by mining could slightly decrease vegetative productivity along Cow Creek for hundreds to thousands of years, as discussed in chapter II, Hydrology.

5. Irreversible and irretrievable commitments of resources: the mine extension would produce about 11.2 million tons of coal through 1984. About 670,000 tons of coal would not be recovered and would be lost to future mining, owing to the limitations of surface mining technology. At the average annual coal production rate of 3 million tons/year, about 675,000 gallons of diesel fuel, 48,000 gallons of gasoline, and 3 million kilowatt-hours of electricity would be used at the mine each year. Water consumption would amount to about one-third of the Rosebud mine's total, or about 23 acre-feet/year.

The existing stratigraphy would be permanently altered; however, the stratigraphy is not unusual or intrinsically valuable. The existing topography would be essentially restored by reclamation. Mixing of the stratigraphy and soil horizons would affect hydrologic conditions and revegetation potential as described in chapter II, Hydrology and Soils.

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CHAPTER I

DESCRIPTION OF THE PROPOSAL UNDER CONSIDERATION

A. SCOPE OF ANALYSIS

Western Energy Company has applied to the Montana Department of State Lands (DSL) for a permit to extend Area E of its Rosebud coal mine near Colstrip, Montana into sections 2 and 11, T. 1 N., R. 41 E. (See figs. I-1 and I-2.) Under the provisions of the Montana Strip and Underground Mine Reclamation Act, DSL must approve a mining and reclamation plan (called hereafter the "mine plan") before mining can occur in the proposed area. Western Energy has State and Federal permits for its current Area E operations in sections 1, 2, 3, and 12, T. 1 N., R. 41 E., and sections 34 and 35, T. 2 N., R. 41 E. If the company's proposed mine plan proves acceptable, DSL would amend the existing permit.

The area proposed for mining was examined in an environmental impact statement (EIS) issued by DSL in 1977. Western Energy's current proposal covers a smaller area and is more detailed than its proposal evaluated in the 1977 EIS; in addition, new information on social conditions and the physical environment is available which allows more precise analysis of environmental impacts. For these reasons, DSL has decided to update and supplement the 1977 EIS with this document, which focuses on the extension of the Area E mine into sections 2 and 11, T. 1 N., R. 41 E.

Of the 450 acres included in the permit application, 427 acres have been previously permitted by DSL for use as haul roads, highwall reduction, and other disturbance associated with mining. Western Energy's proposed permit amendment would allow it to mine 276 acres of this area through 1985, the remainder of Area E's life. All of the 427 acres would be bonded for mining-level disturbance, however. The remaining 23 acres of the 450-acre application area, which have not been previously permitted by DSL, would be bonded for associated disturbance. Figure I-2 shows the proposed sequence of mining in Area E; fig. I-3 shows the proposed bonding area. Mining under this application would be confined to section 2. The bonded acreage in section 11 would be used for topsoil storage, haul roads, and a buffer strip.

Average coal production from Area E would be about 3 million tons/year, close to the current average level (table I-1). No new employees would be required at the mine and no new facilities would be built.

Western Energy has applied to the Montana Department of Health and Environmental Sciences (DHES) for an air quality permit for its Rosebud mine. DHES issued a water pollutant discharge permit to Western Energy on March 13, 1980 (permit no. MT-0023965). DSL does not issue air and water quality permits, but can require measures to control fugitive dust and water pollution from mined lands and reclaimed areas.

The Office of Surface Mining, U.S. Department of the Interior, must also approve a mine plan for the proposed area under the Surface Mining Control and Reclamation Act of 1977, but Federal approval is not specifically addressed in this EIS.

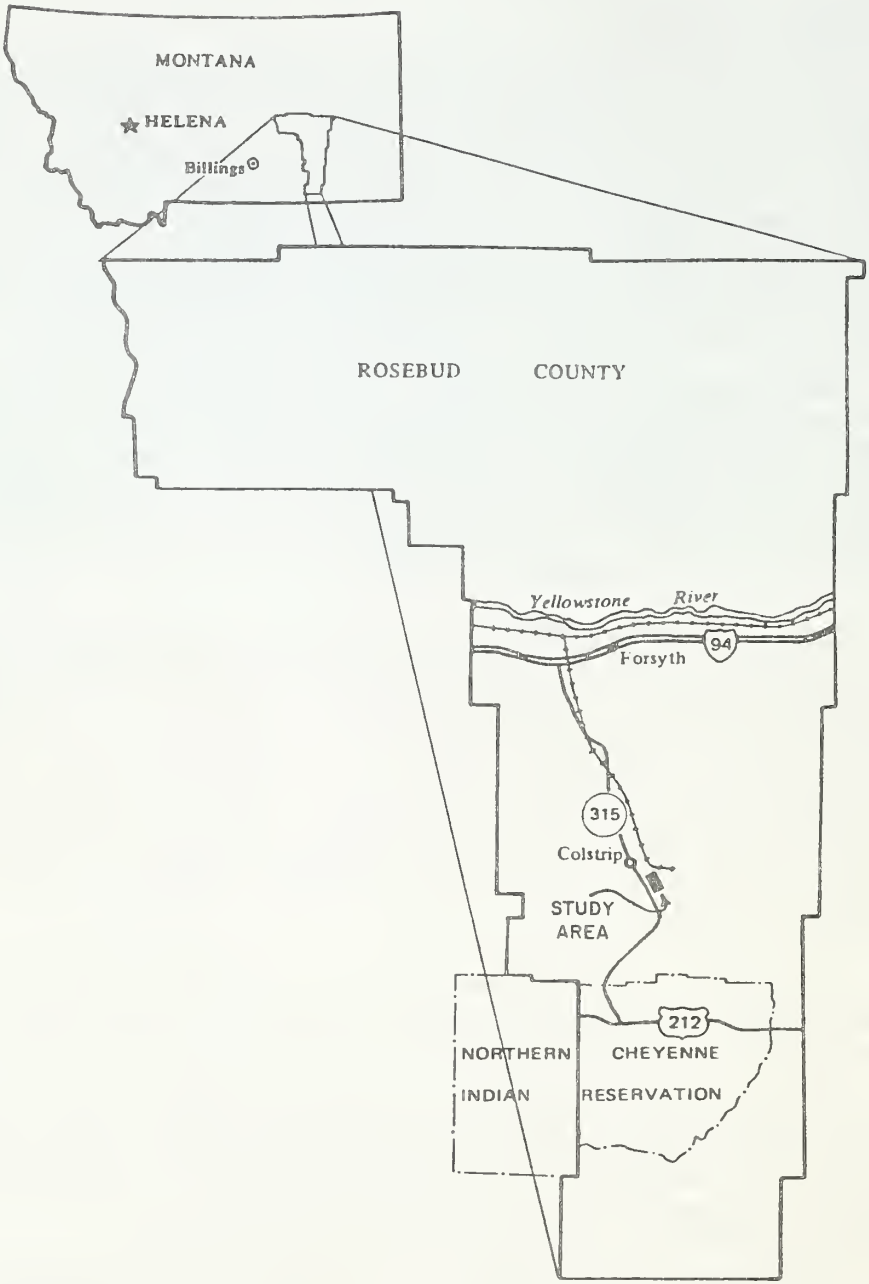

FIGURE I-1.--Location of proposed expansion of Area E ("study area").

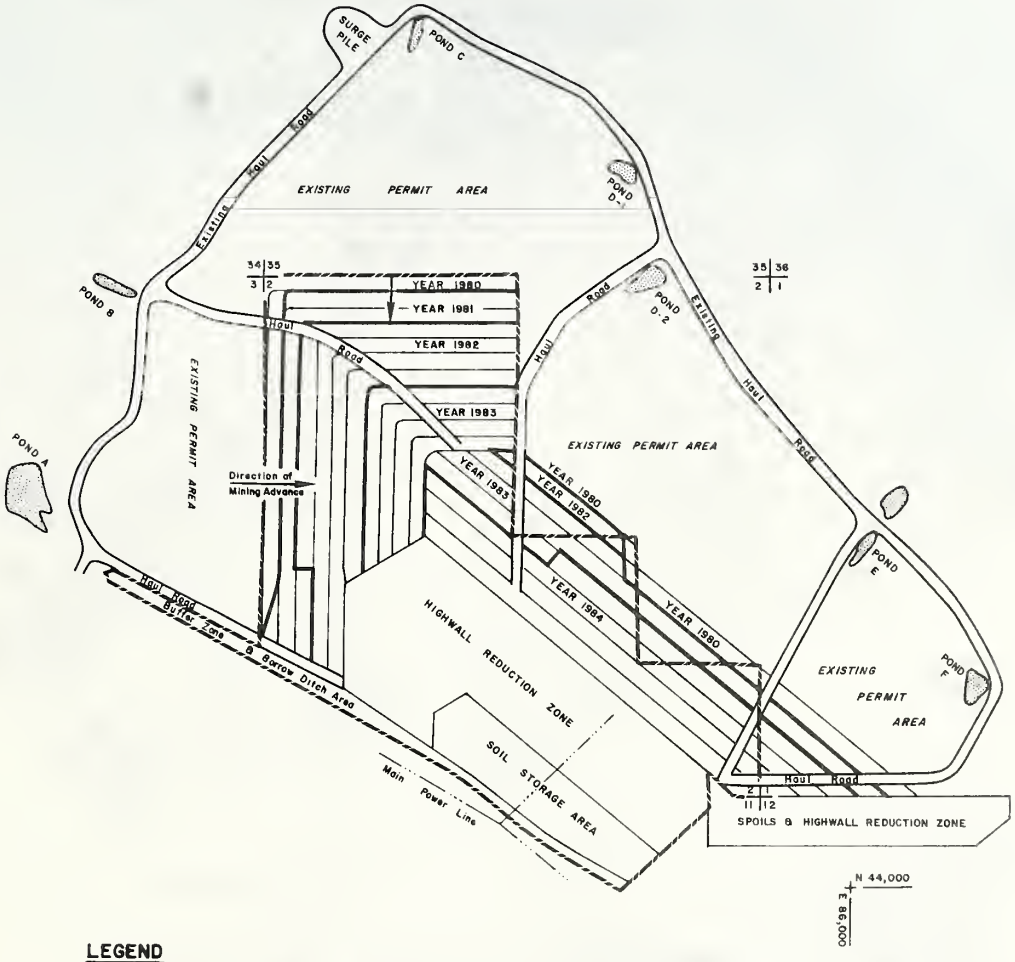

FIGURE I-2.--Sequence of mining at Area E.
Scale: 1 inch equals approx. 1,700 feet.

FIGURE I-3.--Bonding levels within the proposed permit area.

TABLE I-1.--Annual coal production from Colstrip-area mines

[Data are in millions of tons]

Year	Western Energy Co.			Peabody Coal Co.	
	Area E	Other areas	Total	Big Sky	Total
1968	---	0.2	0.2	---	0.2
1969	---	0.5	0.5	0.2	0.7
1970	---	1.7	1.7	1.4	3.1
1971	---	5.2	5.2	1.5	6.7
1972	---	5.5	5.5	1.6	7.1
1973	---	4.3	4.3	2.0	6.3
1974	---	3.2	3.2	2.2	5.4
1975	2.6	3.8	6.4	2.2	8.6
1976	2.4	6.9	9.3	2.4	11.7
1977	2.7	7.1	9.8	2.3	12.1
1978	2.9	7.7	10.6	2.1	12.7
1979	4.1	7.6	11.7	2.5	13.7
1980	5.4	6.6	12.0	3.0	15.0
1981	1.6*	11.3	12.9	3.0	16.5
1982	3.2*	10.3	13.5	4.2	17.7
1983	3.3*	13.7	10.2	4.2	14.4
1984	3.1*	13.9	17.0	4.2	21.2
1985	0	18.0	18.0	4.2	22.2
1986	0	19.1	19.1	4.2	23.3
1987	0	19.1	19.1	4.2	23.3

*Production under this application.

The Rosebud mine was discussed in volumes 1 and 3 of FES 80-1, a regional analysis of coal development in the northern Powder River basin (U.S. Department of the Interior and Montana Department of State Lands, 1980). FES 80-1 provides an overview of the cumulative impacts of mining and electric power generation in the Colstrip area, to which Area E of the Rosebud mine contributes.

B. MINE HISTORY

Part of Area E was mined by the Northern Pacific Railroad from 1925 through 1945, before Western Energy acquired the Rosebud mine. The coal was used for steam locomotives and domestic purposes. Western Energy began mining coal from Area E in 1975 under permit 73003 issued by DSL in December, 1973. Western Energy sold the coal to its parent company,

Montana Power, for use at the Corette electric generating plant in Billings. The Department issued permits to expand Area E in 1975, 1976, and 1977. The latter permit (77003-A001) was issued for a 5-year period and was the subject of an EIS (Montana Department of State Lands, 1977). The Department approved amendments to permit 77003 in 1978 (for an equipment corridor) and 1979 (to widen the equipment corridor). The application now under consideration would further amend permit 77003 to allow expanded mining in Area E.

C. WESTERN ENERGY COMPANY'S PROPOSAL

1. Summary

Western Energy's Area E mine is in southwestern Rosebud County, Montana, about 1 mile southeast of the town of Colstrip (fig. I-1). Coal from Area E is hauled an average of 1-1/2 miles to the Area E coal handling facilities (shown as the "surge pile" in fig. I-2). Coal from Area E is either stockpiled for use in units 1 and 2 or shipped to meet contracts with utility customers. Western Energy sells 680,000 tons/year to Montana Power Company's Corette generating plant in Billings, Mont., and 2,500,000 tons/year to Montana Power's and Puget Sound Power and Light's Colstrip generating units 1 and 2.

The land surface under consideration in this permit amendment application is leased to Western Energy by Burlington Northern, Inc. (fig. I-4). The coal to be mined is Federally owned. Western Energy obtained the Federal coal lease for section 2, T. 1 N., R. 41 E. in 1975 (Billings 02989-07087) and in 1979 (#M35735).

The proposed mine area contains 11.2 million tons of economically recoverable coal in the Rosebud seam. Those reserves would be mined through 1985 at an average annual rate of 3 million tons/year (table I-1). Mining in Area E would be completed in 1984.

Of the six coal seams underlying the proposed mining area, only the uppermost two, the Rosebud and the underlying McKay, are of economic importance. Western Energy mines only the Rosebud seam. Western Energy has not found a market for McKay coal, which has a higher sulfur content than the Rosebud coal and has a tendency to form slag in some steam boilers.

2. Facilities

Western Energy does not propose to build new facilities for the Area E extension. Existing facilities include:

- A 0.1-mile access road to highway FAP 39.
- A 2.2-mile railroad track.

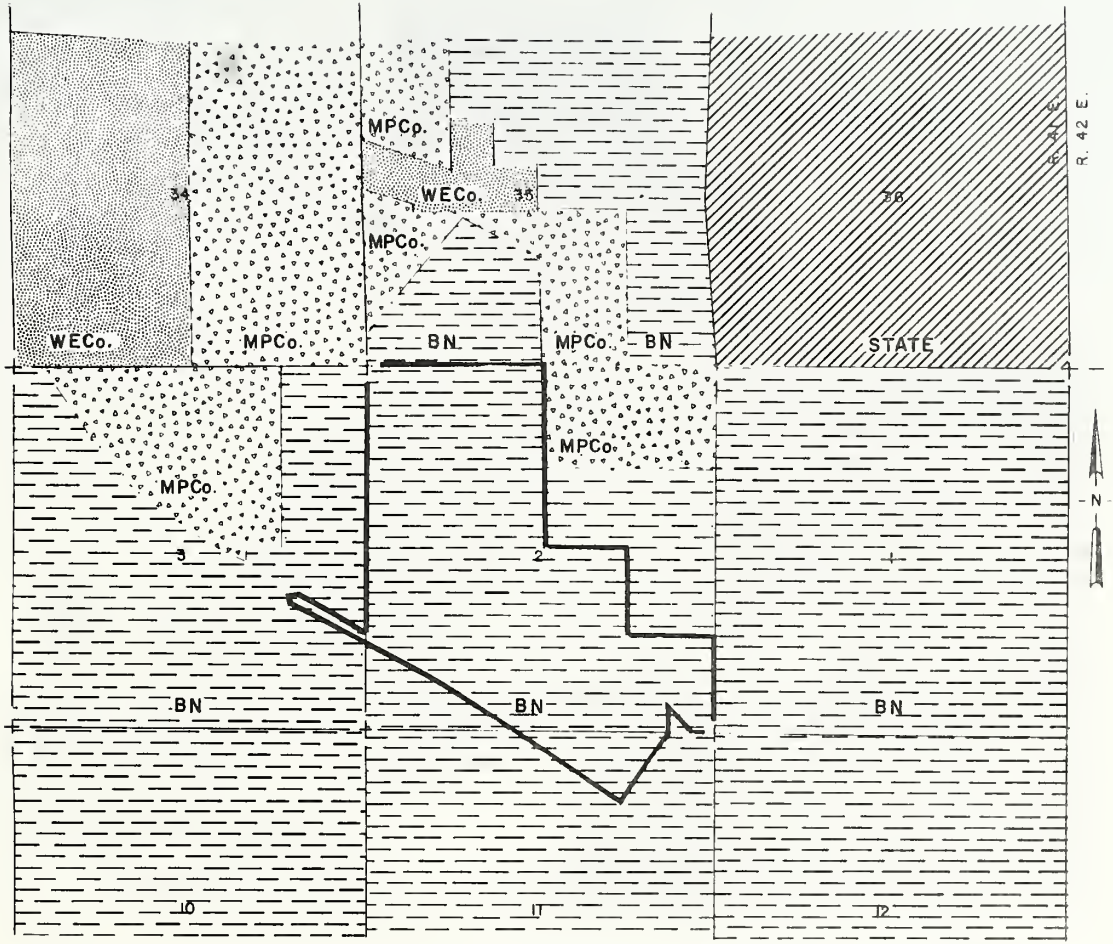

FIGURE I-4.--Surface ownership at Area E.

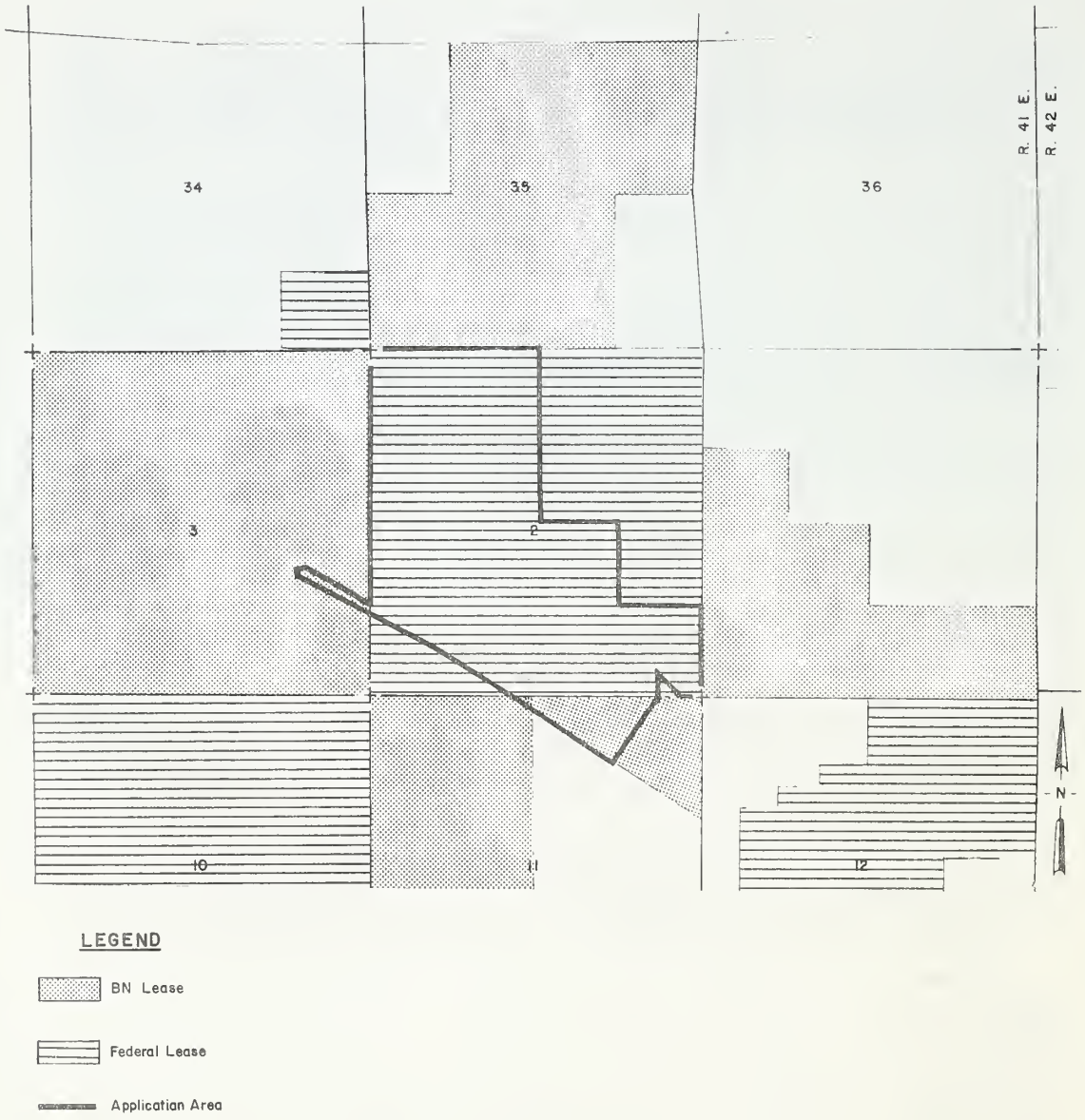

FIGURE I-5.--Coal leases held by Western Energy Company at Area E.

- Several steel-framed structures, a maintenance shop, change rooms, and bath facilities.
- Fuel tanks and explosive storage facilities.
- Coal-handling facilities: primary and secondary crusher, coal surge pile, and tipple loadout with weighing stations.
- Existing haul roads with new extensions into the pit.
- A 12.5 kV and 4.16 kV powerline.
- Portable substations to provide power to equipment in the pit.

3. Mining Plan

Western Energy's submittal covers a 4-year mining plan for the proposed area, at which time mining in Area E will be completed. The anticipated mine life also includes 3 years to establish stable seeded areas and postmining monitoring areas, and 10 years of management to bond release, for a total of 17 years. A total of 420 acres out of the 450-acre permit area would be disturbed during this time: 276 acres of mining, 100 acres of highwall reduction area, 10 acres of topsoil storage area, and 34 acres in the spoil and highwall reduction zone. An additional 30 acres that are too steep to mine would remain undisturbed.

Western Energy will extract the coal using the area surface mining method. This mining method is used in all of its operations at Colstrip. The first dragline pass will be a continuation of the existing Area E mining operations. Successive passes will be made parallel to the first pass so that mining will advance in the direction indicated by the arrows in figure I-2.

Topsoil and subsoil will be stripped for the mining area in advance of each pass in two separate lifts. Average depth of topsoil stripped will be 6 to 8 inches. This will be accomplished by scrapers which will strip, transport, and deposit the topsoil on regraded areas.

After topsoil has been removed from a sufficient area, subsoil will be removed to an average depth of 2.5 feet. Overburden will then be stripped using a dragline, assisted at times with mobile diesel equipment.

The overburden removed from the current pass will be cast into the empty pit remaining from the preceding pass. This overburden will then be regraded to the approximate original contour.

As the Rosebud coal seam is exposed in each pass, the coal will be excavated by loading shovels or mobile diesel equipment. These machines will load the coal into coal haulers. These haulers will transport the coal to the existing handling facilties.

The final cut will be backfilled and regraded to slopes no greater than 5:1 (20 percent) with material from the highwall reduction zone.

4. Reclamation Plan

The reclamation program will include at a minimum: topsoil and subsoil salvaging, backfilling, regrading, highwall reduction, drainage reconstruction, topsoil and subsoil redistribution, revegetation, and monitoring. Western Energy will plant native grass mixtures, and interseed and transplant forbs, shrubs, and trees at a frequency similar to that which existed before mining. After being reclaimed, Area E would be used for livestock grazing and wildlife habitat.

Additional detail concerning Western Energy's reclamation plan, including postmining topography, soil salvage depths, and seed mixtures, is found in chapter II, Appendix F-1, and in the company's permit application which is on file with the Department of State Lands.

CHAPTER II

ANALYSIS OF WESTERN ENERGY COMPANY'S PROPOSAL

A. GEOLOGY

1. Summary of Impacts

Impacts on topography and geomorphology would not be significant because the company's proposed mine plan would minimize erosion over the long term. Erosion on the reclaimed minesite would at first be higher than on most native range lands near Colstrip, but erosion rates are expected to approach premining levels within 3-4 years after revegetation.

2. Description of the Existing Environment

a. Topography and geomorphology

The topography and geomorphic setting of Area E is typical of southeastern Montana. The unmined portion of Area E is higher than the adjacent landscape (fig. II-1). The ridge running roughly north-south through Area E acts as a drainage divide between East Fork Armells Creek on the west and Cow Creek, tributary to Rosebud Creek, on the east. Half of the proposed permit area drains into East Fork Armells Creek and half drains into Cow Creek. Small ephemeral drainages start near the ridgetop crest, in middle of the unmined portion of Area E, and drain the area in both directions. The topographic relief from the top of the rolling ridge to the nearby lowlands is about 200 feet.

Because the native rangeland in Area E is in fair to good condition, erosion rates are probably moderate to low. Empirical measurements of erosion in the area are lacking. Western Energy has proposed to study erosion rates on both native rangeland and mine reclamation areas. The company is required to implement such a study in order to gauge if they have successfully reclaimed the mine areas for bond release purposes; the reclaimed landscape must be as erosion resistant as the premining landscape before bond can be released. Western Energy has begun a baseline erosion study, but DSL may require changes in the study in order to standardize such studies from one mine to another.

b. Overburden

Previous overburden sampling in Area E (Montana Department of State Lands, 1977) did not cover the area to be mined. Additional overburden test cores were taken from eight locations in the proposed mining area for this permit application. The test holes were located 1000 feet apart, although DSL guidelines only require that they be 2000 feet apart. Table II-1 shows which elements in the eight samples exceed State suspect levels. The indicated suspect levels suggest that reclamation and post-mining land use may be affected if spoils with those properties are moved near the surface (see section 3, Impacts of the Proposal).

FIGURE II-1.--Existing topography at Area E.

TABLE II-1.--Overburden properties significantly exceeding State suspect levels

Core hole	Location	Property	Length of affected core	% total core	Observed value ($\bar{X}$)	State suspect level
	Section 2, T.1 N., R.41 E.					
N46-E64	SE1/4 SE1/4	Molybdenum	90'	69%	0.44 ppm	>0.30 ppm
N47-E62	NE1/4 SW1/4	Molybdenum	65'	32%	0.50 ppm	>0.30 ppm
N47-E63	NW1/4 SE1/4	Molybdenum	85'	53%	0.61 ppm	>0.30 ppm
N48-E61	S1/2 NW1/4	Molybdenum	55'	33%	0.49 ppm	>0.30 ppm
N48-E62	SE1/4 NW1/4	Molybdenum	120'	57%	0.65 ppm	>0.30 ppm
N49-E61	Center NW1/4	Molybdenum	200'	98%	0.66 ppm	>0.30 ppm
		Manganese	35'	17%	83.9 ppm	>60.0 ppm
		Nickel	50'	24%	1.58 ppm	>1.00 ppm
N49-E62	E1/2 NW1/4	Molybdenum	110'	63%	0.47 ppm	>0.30 ppm
N50-E61	N1/2 NW 1/4	Molybdenum	180'	88%	0.43 ppm	>0.30 ppm

c. Stratigraphy and structure

The Colstrip area is at the northern end of the Powder River basin, a broad, shallow syncline (trough) between the Big Horn Uplift to the west, the Black Hills Uplift to the east, and the Porcupine Uplift to the north. The ancient Powder River basin is filled with several thousand feet of sedimentary strata dating from 600 million years ago to relatively recent deposits. Erosion has removed much of the younger strata exposing the Tongue River Member of the Fort Union Formation. This unit, comprising interbedded sandstone, siltstone, coal, and shale, has a maximum thickness in the Colstrip area of about 450 feet (Montana Department of State Lands, 1977). The Tongue River Member has 6 prominent coal seams remaining; only the top two, the Rosebud and McKay (fig. II-2), are currently economically feasible to mine. The Rosebud seam averages 24 feet thick; the McKay, 8 to 10 feet thick. The interburden that separates the seams in Area E varies in thickness from 12 to 22 feet, averaging near 17 feet.

The McKay coal seam at the Rosebud mine is not being mined because Western Energy has not been able to find a market for the coal. The McKay coal has more sulfur and lower BTU value than the Rosebud coal (see

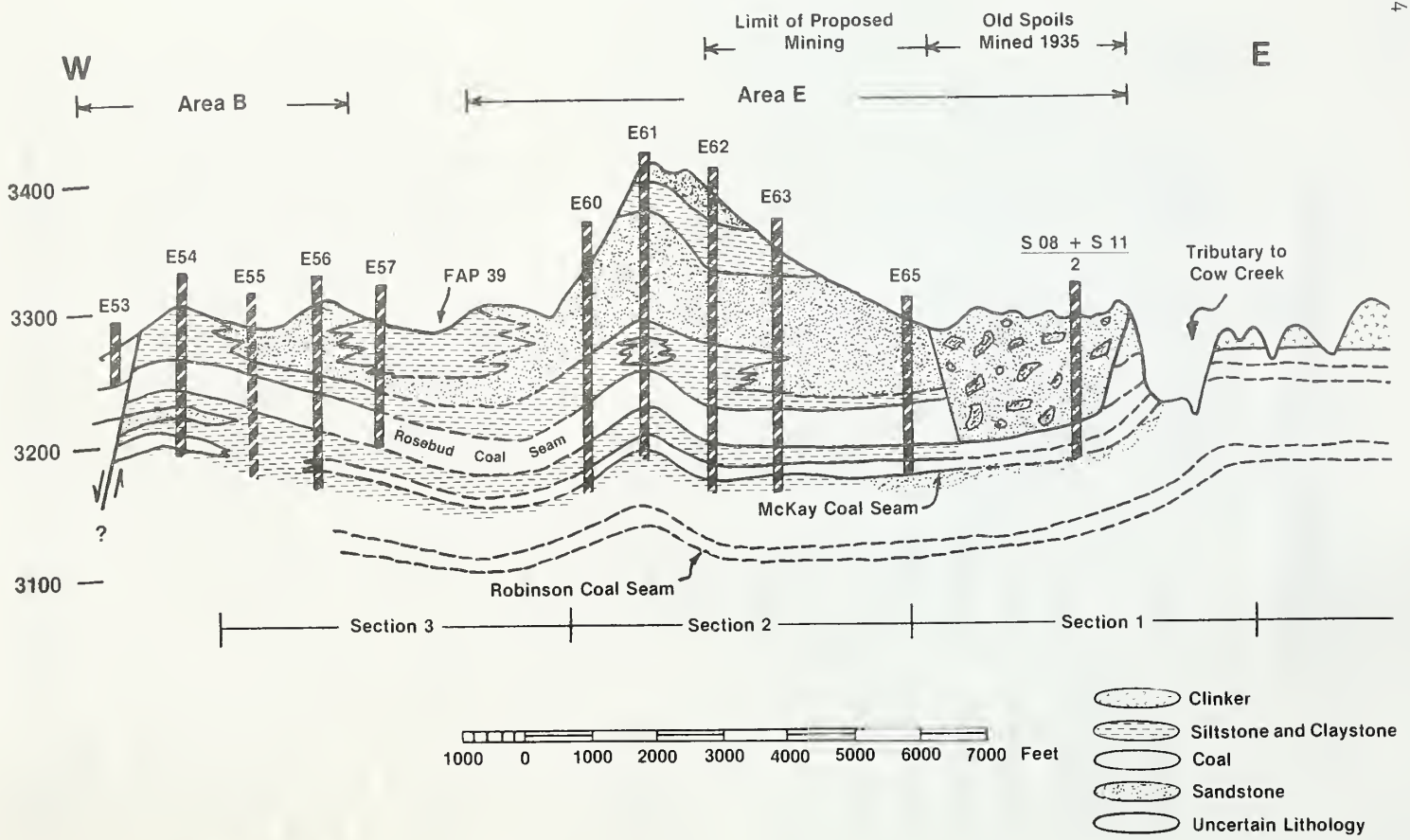

FIGURE II-2.--Geologic cross-section across Areas E and B (due east-west at N47,000--approximately the center of sections 1, 2, and 3, T. 1 N., R. 41 E.). Solid lines show known contact; dashed lines show inferred contact.

chapter III, Technological Alternatives). The Rosebud coal averages 8,600 BTU as received and .7 percent sulfur (Western Energy Company, written commun., March 7, 1980).

The Rosebud overburden and the Rosebud-McKay interburden in the Colstrip area is composed of variable amounts of sandstones, siltstones, and shales (fig. II-2). These units often are not distinct, but blend into one another laterally and vertically.

The geologic history and structural setting of the Powder River basin and the Colstrip region is summarized in Dollhopf and others (1978b); therefore, only the site-specific structural setting is discussed here. The top of the Rosebud coal seam at the Rosebud mine has an undulating surface with localized troughs (synclines) and ridges (anticlines)(fig. II-2). The axis of these features generally is oriented northwest-southeast. The ridges have locally fractured the coal seams, allowing the coal to transmit more ground water than is naturally the case (see Hydrology).

3. Impacts of the Proposal

a. Topography and geomorphology

With proper management, Area E would be as geomorphically stable after reclamation as before mining. This is so because the regraded land surface would closely approximate the premining landscape (see fig. II-3).

Until the area has been revegetated (a few years after mining), erosion rates may be fairly high; however, ponds would capture most of the eroded sediment and prevent it from reaching streams off the minesite. If revegetation succeeds and postmining land management practices foster a good vegetative cover (this appears likely--see Vegetation), then erosion rates at Area E would probably be less than before mining. The company would not be allowed to remove the sediment ponds until it demonstrated that erosion rates were no higher than before mining; therefore, the amount of sediment reaching offsite streams would be no greater than before mining.

Western Energy proposes five measures to help control erosion on Area E: the landscape will be shaped into a complex slope configuration; all slope angles will be 20 percent or less; a relatively dense network of drainages similar to the premining drainage network will be constructed; topsoil will be placed along topographic contours rather than up and down slopes; 1-1/2 to 2 tons/acre of straw mulch or 1 ton/acre of wood fiber will be applied to freshly topsoiled areas on slopes greater than 10 percent. As described below, these steps would provide a good setting for vegetative establishment.

Complex slopes (convex at the top, straight along the middle and concave or dish-shaped at the base) have been shown to be less erosive than long uniform or convex slopes (Wischmeier and Meyer, 1973). Runoff does not gain as much momentum near the top, so the slope can be steeper.

FIGURE II-3.--Proposed postmining topography at Area E.
Contour interval is 10 feet.

By straightening and gradually flattening the slope along the lower portion, the velocity of runoff is reduced, decreasing erosion. Figure IV-1 in the draft EIS on Area B (Montana Department of State Lands, 1980) shows complex slopes in cross-section.

All slope angles on the reclaimed topography of Area E would be less than 20 percent, with the average much less than 20 percent. Slopes steeper than 20 percent are susceptible to accelerated erosion. Slope gradients would closely approximate premining drainage gradients. Some small (1-2 feet deep) gullies would probably develop in reclaimed drainages because existing drainages in Area E have small gullies. The company would be required to implement control measures if gullies over 9 inches developed. Those measures could include filling the gullies with soil, replanting, and placing straw bales to reduce runoff velocity.

By constructing a relatively dense network of drainages, the length of the hill slopes of Area E would be shorter. Shortening the slope lengths reduces the area which would be subject to excessive overland runoff flow. Runoff would be directed towards drainages that are better suited for faster and higher flow conditions.

Topsoiling on contours rather than working the topsoil either up or down slope creates surface irregularities (i.e. tire compaction and farm equipment traces) that are perpendicular to runoff flows. This increases infiltration, reduces flow velocities, and prevents concentration of runoff.

Straw mulching of the freshly topsoiled reclaimed areas would reduce erosion by: 1) increasing the amount of precipitation that infiltrates into the ground, 2) increasing the soil roughness, reducing overland flow velocities and, 3) lightening the color of the landscape surface which lowers the evaporation loss of soil moisture (reducing heat buildup).

b. Impacts of overburden constituents

Slightly elevated molybdenum (Mo) levels throughout the proposed mining area (table II-1) are a potential problem. The increase in Mo levels would not affect the success of revegetation; however, Erdman and others (1978) associated increased Mo with reduced copper (Cu) to Mo ratios in plant tissue, especially in sweet clover. Ruminants grazing on vegetation with a low (narrow) Cu:Mo ratio would be susceptible to molybdenosis, a copper-deficiency disease that occurs particularly in young calves and sheep. The physiological availability of Cu in the animal is depressed due to the effect of elevated Mo levels. (Dollahite and others, 1972).

A relationship has not yet been found between the Cu:Mo ratio in overburden or soil and that found in associated plant tissue. Assuming that a similar Cu:Mo ratio would be found in the reestablished vegetation as is found in the overburden material, molybdenosis is not likely to occur because the Cu:Mo ratio in the overburden appears to be high (wide)

enough to reduce the impacts in most of the proposed mining area. In addition, legumes appear to accumulate Mo much more than other plants (Kubota, 1975), and, based on the proposed seed mixture, legumes are not expected to be present in significant amounts in the reclaimed vegetative communities. The company plans to replace topsoil and subsoil over the disturbed area prior to revegetation. This will further prevent problem levels of Mo from occurring in the vegetation.

Manganese (Mn) levels in portions of core N49-E61 exceed State suspect levels. Because the pH levels of the overburden in the proposed mining area are mostly between 7.0 and 8.5, Mn toxicity in the reestablished vegetation would probably not occur. Mn is not readily taken up by plants at pH levels of 6.4 and greater (Tisdale and Nelson, 1975). In addition, Dollhopf and others (1978a) report that when the problem material constitutes less than 5 percent of the total overburden volume (as in the case here), such material is essentially undetectable in the spoil pile because of the mixing that occurs during mining.

Nickel (Ni) levels in portions of the same test core (N49-E61) slightly exceed the State suspect level. Ni has been reported to be potentially toxic to some plant species at relatively low concentrations (Sauchelli, 1969); however, the suspect level appears to be conservative. The Ni concentration given in table II-1 constitues less than 5 percent of the total overburden material; therefore, as with manganese, mixing of the overburden during mining would dilute the Ni to essentially undetectable levels. Because of this mixing, and because the suspect level is conservative, no problems are anticipated regarding plant toxicity from nickel.

Analysis of the overburden for other chemical properties demonstrated considerable variability within every test core; however, only small amounts of core material in isolated pockets approached or exceeded State suspect levels. These isolated pockets of potentially toxic materials would be diluted considerably during mining and therefore are not expected to adversely affect reclamation or postmining land use.

B. HYDROLOGY

1. Summary

The primary impacts of mining in the Area E extension would be the addition of salts to the Cow Creek drainage; this would result from contamination of ground water by mine spoils. The extension would increase the amount of mine spoils upgradient of Cow Creek by 11 percent; ground water passing through the spoils would pick up salts.

Spoils from the 276-acre Area E extension alone would not add salts in sufficent quantities to have a serious effect on Cow Creek. However, the granting of the Area E extension and a pending permit application for an Area B extension would expand the size of the entire Rosebud mine

considerably (by 42 percent). Thus, the cumulative hydrologic impacts on Cow Creek of continued expansion of the entire Rosebud mine would be much more significant than the impacts resulting from mining only in existing and permitted areas. The cumulative impacts would be even greater if coal is mined from Area D, which also is in the headwaters of Cow Creek.

Levels of total dissolved solids (TDS) in ground water passing through spoils from mining in Area E, Pit 3, and Area B would probably increase to 2 to 3 times the TDS levels of ground water upgradient of the spoils. The expected range of TDS levels in degraded ground water downgradient of spoils is 3,000 to 5,000 mg/1 (milligrams per litre). (Total dis- solved solids indicate the mineralization and salinity of water.)

Ground water degraded by existing and permitted area mine spoils will flow primarily east, into the Cow Creek drainage, increasing salt levels in the upper one third of the drainage by 5 to 35 percent. The added salts could intensify existing problems with saline crusting in areas along the drainage, and could decrease vegetative productivity for hundreds to thousands of years. The Area E extension would add another 1 to 4 percent to the mine-generated salt load of the upper third of Cow Creek.

Many of the impacts on water quality could be reduced by implementing mitigating measures discussed at the end of this section of chapter II and in chapter III, Technological Alternatives.

2. Description of the Existing Environment

a. Surface water

The north-south ridge within Area E (fig. II-1) is a drainage divide between East Fork Armells Creek and Cow Creek. Because Area E encompasses only headwater tributaries to those streams, runoff is normally very small and sporadic, occuring only in response to snowmelt and intense rainstorms.

Cow Creek would be more affected by mining in the Area E extension than would East Fork Armells Creek for the following reasons: (1) approximately two-thirds of the area to be mined drains into Cow Creek, (2) the drainage area of Cow Creek and the South Fork of Cow Creek is about half that of East Fork Armells Creek; thus, the mine area constitutes a greater percentage of Cow Creek's drainage area, and (3) most ground water moving through Area E will flow east, toward Cow Creek. Because it would receive most of the mining impacts of the Area E extension, the ensuing discussion emphasizes the Cow Creek drainage.

Cow Creek appears to meet the criteria for alluvial valley floors (AVF) set forth in the Montana Strip and Underground Mine Reclamation Act: it is underlain by alluvial deposits and is flood irrigated. Additional studies of surface and ground waters east of Area E would be necessary to determine whether Cow Creek is an AVF.

Cow Creek is used for livestock watering and irrigation of alfalfa and native hay meadows. Wildlife also use its waters. Surface runoff in the drainage and flood flows which spread out over the low-lying terraces along Cow Creek and its tributaries aid vegetative growth. Shallow ground water also increases vegetative growth along Cow Creek where the ground water is near the ground surface (by subirrigation).

Two to three miles east of Area E, earthen spreader dikes back up flood flows of Cow Creek, irrigating at least 10 acres of an alfalfa field (fig. II-7). The Kluver ranch, further downstream, has a few, old spreader dikes that aid in the occasional flood irrigation of native rangeland, primarily during periods of high runoff (Patty Kluver, oral commun., August 19, 1980).

The quality of surface water in Cow Creek varies greatly, depending on season and location. Because water quality samples of the creek were not taken until 1977, almost 50 years after mining in the drainage started, the exisitng water quality can be characterized but the exact impacts of mining on the creek cannot be assessed.

Near its confluence with Rosebud Creek, Cow Creek exhibits the marked seasonal fluctuations in water quality typical of small streams in southeastern Montana (U.S. Geological Survey, unpublished data and Skogerboe and others, 1980). However, the surface water of Cow Creek contains uncommonly high amounts of salts (TDS levels recorded near the confluence averaged nearly 5,000 mg/l). The excessive amounts of salt have adversely affected agricultural use of the land in some areas along the creek. Saline crusting on soils has been reported along the lower reaches of Cow Creek (Patty Kluver, oral commun., August 1980). Possible causes of the elevated levels of salts are: the use of spreader dikes upstream, the uncommonly high water table along Cow Creek in the past few years, and the geology of the area.

Water quality in the upper reaches of Cow Creek generally is better than in the lower reaches. There are springs in 8 of the 10 tributary drainages in the headwaters of Cow Creek; their water quality is similar to that of other springs in the Colstrip area. The two tributaries without springs may be affected by seepage of mine spoil water (see Current Mining Impacts), but there is not enough seepage to account for the high level of salts that have been observed in lower Cow Creek. Because measurements of surface flows that originate from sources other than springs are not available for Cow Creek, DSL's ability to accurately identify the sources of the salts is limited.

Several stock ponds have been built in small tributaries that flow into Cow Creek. One water quality sample taken from a pond just east of Pit 6 on South Fork Cow Creek had total dissolved solids of over 7,000 mg/l. Cattle will refuse to drink water with much higher TDS levels, and horses reportedly will refuse water with TDS levels above 5,000 mg/l (Klarich and Thomas, 1977). Alkaline crusting around many of the stock ponds in the headwaters of Cow Creek is reported to be common (Baily Egan, oral commun., August 1980).

b. Ground water aquifers

The natural ground water system at Colstrip contains three predominant aquifers and two other geologic units that could be tapped for water. The predominant aquifers are the Rosebud and McKay coal seams (fig. II-2) and the shallow alluvial ground water system of East Fork Armells Creek (Montana Department of State Lands, 1977). The Rosebud and McKay aquifers normally are used for domestic and agricultural water only when they lie within 200 feet of the surface (Van Vost and others, 1977).

Sandstone units within the Rosebud overburden, the Rosebud-McKay interburden (between the coal seams), and in deeper bedrock units are capable of producing from zero to hundreds of gallons per minute. However, the geologic variability of these units makes them less desirable sources of ground water than the more consistent coal aquifers. The other geologic unit is a zone of saturation that has formed at the base of mine spoils (Dollhopf and others, 1979b).

1) Coal seam aquifers

The Rosebud aquifer (or coal seam) is a major target of ground water wells in the region, especially for stock watering. In Area E, the Rosebud seam has an average thickness of about 24 feet (Montana Department of State Lands, 1977). Mineralization of water within the Rosebud coal seam averages about 1,550 mg/l TDS upgradient of Area E (table II-2) (Van Voast and others, 1977; Dollhopf and others, 1978c). Ground water in the Colstrip area often exceeds the drinking water standards set by the U.S. Public Health Service (1,000 mg/l maximum). Most ground water in eastern Montana exceeds that level.

The Rosebud aquifer and most of the bedrock aquifers within 200 feet of the surface flow primarily to the east (fig. II-4). The flow pattern is controlled by the gradient, transmissivity, and outcrop geometry of the aquifer (Van Voast and others, 1977). The Rosebud aquifer is recharged with water from areas upgradient of Area E, mainly to the west. The Rosebud aquifer and East Fork Armells Creek alluvium recharge and discharge to each other, depending on which aquifer exerts higher pressure.

The Rosebud coal seam probably transmits a total of about 0.4 to 4.4 gpm through Area E (table II-2). Mining upgradient in Area B may intercept a small amount of the ground water that normally would be passing into Area E. After Area B is reclaimed, the Rosebud coal seam is expected to carry more water through Area E than it presently does, especially to the northern part of Area E.

The McKay coal seam (12 to 22 feet below the Rosebud seam) has an average thickness of 8 to 10 feet, generally flows to the east, and transmits about 0.2 to 2.1 gpm through Area E (table II-2). Upgradient of Area E, water in the McKay coal seam is of fairly good quality, averaging about 1,500 mg/l TDS (table II-2 and fig. II-5). Water in the McKay aquifer near Colstrip is degraded locally by seepage from existing mine spoils (see Current Mining Impacts).

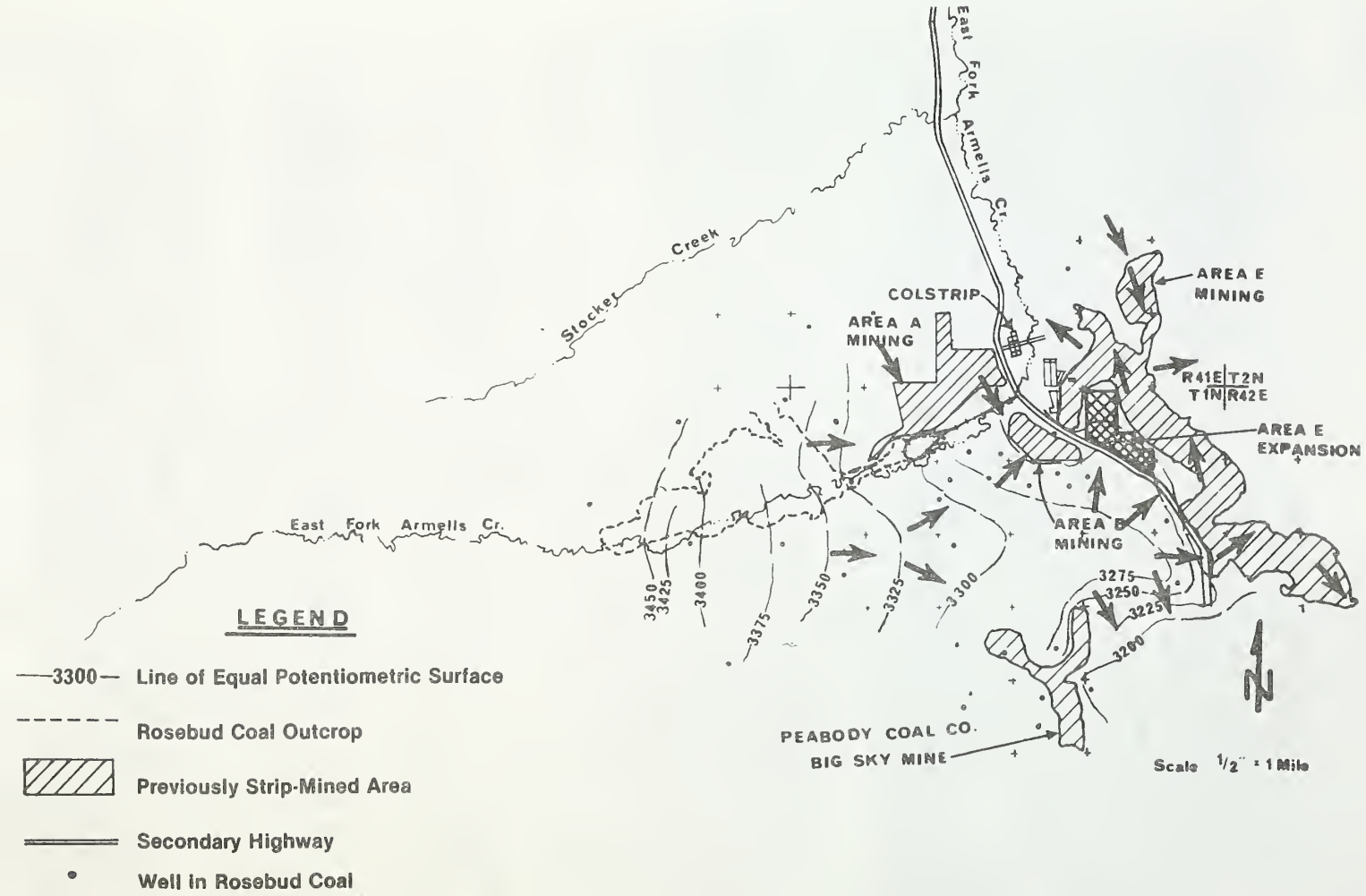

FIGURE II-4.--Potentiometric surface of the Rosebud coal seam. Arrows show direction of ground water flow in the Rosebud coal and in mine spoils (area of diagonal rules).

TABLE II-2.--Estimated ground water characteristics of Area E*

Aquifer	Thickness (feet)	Water Quality In Total Dissolved Solids (mg/l) low (average) high	Gradient (ft/mi)	Transmissivity (gpd/ft)	Aquifer Width (ft)	Flow (gpm)
E. Fork Armells Creek gravels						
(1 mile upstream of Colstrip)	23-26	1990-(2326)-2600	25	12,200		50
(1.5 miles downgradeint of Colstrip)	20-50	2900-(2930)-2990				
Rosebud overburden	variable	345-(1309)-2939	10-20	184 median 281 mean	10,000	2.4-7.5
Rosebud coal seam	24	636-(1547)-4606[1]	20-40	16 median 84 mean	10,000	0.4-4.4
Rosebud-McKay interburden	12(17)22	684-(1907)-2700	10-30	5 median 13 mean	17,000	0.1-0.9
McKay coal seam	8-10	714-(1490)-2288[2]	10-30	7 median 31 mean	17,000	0.2-2.1
Spoils (Area E extension)	5-7		30	167	10,000	6.5
(Entire Area E)		2720-(3712)-5455[3]			15,000	10
(Entire Rosebud Mine)		1097-(2936)-5455[3]				

*Most of the information in this table is revised from table II-2 the draft EIS (changes are underlined).
[1]See Appendix B-3 for data on Rosebud coal seam water quality.
[2]See Appendix B-4 for data on McKay coal seam water quality.
[3]See Appendix B-1 for data on Rosebud mine spoil water quality.

2) Alluvial aquifers

The other aquifer extensively used as a source of ground water in the Colstrip area is the East Fork Armells Creek alluvium. It is 30 to 40 feet thick and is composed of gravel overlain by clay. The gravel transmits water at about 50 gpm (VanVoast and others, 1977). TDS levels in East Fork Armells Creek gravels average about 2,200 mg/l 1 mile upstream from Colstrip, and over 2,900 mg/l 1.5 miles downstream from Colstrip (Van Voast and others, 1977). Seepage from industrial ponds associated with Montana Power Company's generating units 1 and 2, the community sewage treatment plant, lawn watering, and seepage from mine spoils and impoundments may contribute to decreased water quality downstream; however, a water quality decrease in the downstream direction commonly occurs in drainages of the region. Seepage from Area E probably contributes only slightly to the total non-natural increase in TDS affecting East Fork Armells Creek alluvium, and is not viewed as a problem for current water users.

3) Other aquifers

Sandstone within the Rosebud overburden, the Rosebud-McKay interburden, and below the McKay seam varies greatly in thickness, size, and location (fig. II-2). Lateral and vertical variation in lithology of the overburden and interburden, which controls the movement of ground water through the sandstone, makes it hard to determine the amount and location of ground water (Dollhopf and others, 1978a). The estimated flow rate through the overburden in Area E ranges from 2.4 to 7.5 gpm. Total dissolved solids in overburden in the Colstrip area range from 345 to 2,939 mg/l, averaging 1,309 mg/l (table II-2).

The thickness of the Rosebud-McKay interburden varies from 12 feet in the eastern part of Area E to 22 feet in the western part; the average thickness is 17 feet. Natural water quality within the Rosebud-McKay interburden varies from 684 to 2,700 mg/l TDS (table II-2). The interburden ground water has been degraded by seepage from industrial ponds associated with Montana Power generating units 1 and 2; one well near the ponds in the interburden recorded TDS levels of over 10,000 mg/l. The average lateral rate of flow in Area E interburden is fairly low--less than 1 gpm (table II-2). Higher flow rates of up to 30 gpm may occur in Area E due to fractures in the strata caused by folding millions of years ago (Botz, 1978) (fig. II-2 and chapter II, Geology).

The Rosebud coal aquifer, the Rosebud-McKay interburden, and the McKay coal aquifer appear to be hydrologically connected in places (Botz, 1978). This appears to be largely attributable to the sandstone in the interburden, which allows ground water to move upwards or downwards, hydrologically connecting the various strata (fig. II-8).

In certain localities near Colstrip, ground water within the McKay aquifer appears to be moving not only horizontally, but upwards through the interburden into overlying strata. In other areas, ground water

appears to be moving downward through the interburden into the McKay coal seam (fig. II-8). Where the Rosebud-McKay interburden is thin or sandy, the amount of ground water passing into or out of the McKay would be greater than in areas where the interburden is more aggregated (i.e. consists of more shale or silt) (Dollhopf and others, 1978a).

Because of the hydrologic connections between the various strata, ground water contaminated by mine spoils is affecting lower aquifers; McKay ground water is degraded in the southeast corner of Area E and the extreme southeast corner of Pit 6. (See fig. II-5 and the portions of this section titled of Current Mining Impacts and Impacts of the Proposal.)

3. Impacts

Because the entire Rosebud mine is connected hydrologically, the impacts of the proposed Area E extension on hydrology cannot be assessed without also examining the impacts of past, present, permitted, and possible future mining of the entire area. Thus, this portion of the EIS is organized to examine: (1) current mining impacts, (2) future impacts of current mining and mining in permitted areas, and (3) impacts of the proposal.

a. Current mining impacts

After reevaluating hydrologic information, some of which was gathered by Western Energy since the draft EIS was issued, DSL concludes that Cow Creek has not been affected by mining to the extent indicated in the draft. Nevertheless, seepage of water from mine spoils has degraded bedrock ground water and may have degraded alluvial ground water.

At present, detectable effects of mining on water quality in Area E are confined to the shallow alluvium within a mile or two of the existing mine area and to bedrock aquifers within a few hundred feet of the mine. Because very little degraded ground water is presently reaching surface water near the mine, the addition of salts to areas near the mine is not considered significant. However, after the mine pit in Area E is reclaimed, off-site impacts are expected to increase.

1) Bedrock ground water

Ground water that has accumulated at the base of the existing mine spoils is of much lower quality than incoming ground water; total dissolved solids in spoil water in Area E average about 3,700 mg/l (table II-2 and fig. II-6)--over twice the average TDS value found in shallow bedrock upgradient of Area E. For example, the TDS level in the Rosebud overburden averages 1,300 mg/l; in the Rosebud coal seam, 1,500 mg/l; in the Rosebud-McKay interburden, 1,900 mg/l; and in the McKay coal seam, 1,500 mg/l.

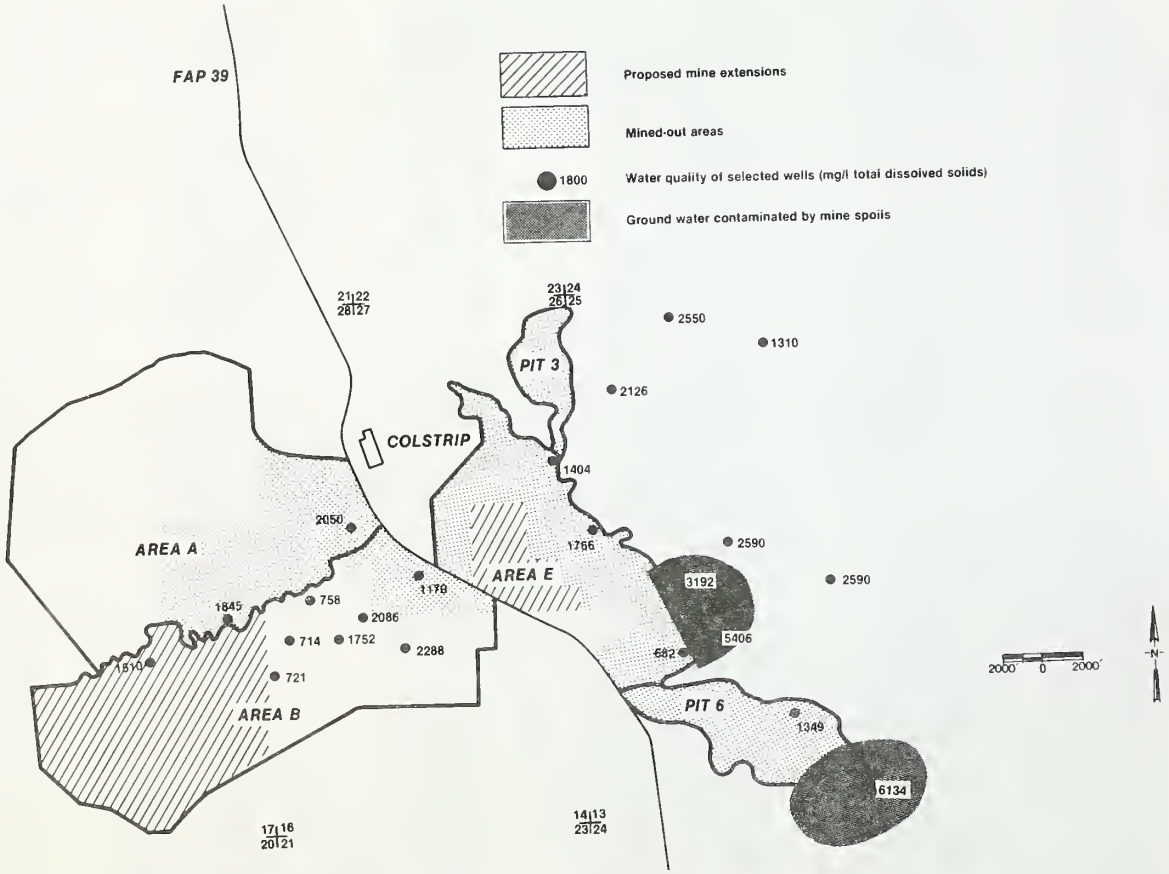

FIGURE II-5.--Ground water quality in the McKay aquifer.

There are two reasons why the salt level in ground water increases when the water comes in contact with spoils. One reason is that overburden strata that has not been in contact with ground water contains salts. When the overburden is mined and dumped back into the pit (as broken-up mine spoils), ground water passing through the spoils will dissolve the salts, thereby degrading ground water quality). The second reason is that the physical breakdown of overburden by weathering and microbial action can quickly form soluable salts (where there were none before) from shales and siltstone (McWhorter and others, 1975). Salt increases in mine spoils at the Rosebud mine are probably a result of both of these processes.

Bedrock aquifers downgradient from (east of) Area E have been contaminated by spoils water. Three observation wells in the McKay aquifer have TDS levels that are over twice the average values for nearby, unaffected wells in the same aquifers (Appendix B-4). Water in two of the McKay aquifer wells is of worse quality than the spoil water upgradient (well S-04: 6,134 mg/l and well WM-127: 7,490 mg/l). It is difficult to explain why water quality in these wells is so poor. It probably results in part from mining, but spoils water alone could not result in TDS levels this high. Other, unknown sources also must be contributing poor quality water to the wells. The three wells in the McKay coal seam are in the southern part of Area E and the extreme southeastern part of Pit 6 (fig. II-5). The affected wells correspond closely to areas of suspected downward ground water movement.

In most cases, ground water in the Rosebud coal seam has not spread much beyond a very localized area near the Area E mine. Mining of the Rosebud seam began at the coal outcrop and clinker and burn line and progressed west, so most of the seam has been mined out downgradient (east) of Area E. The Area E spoils are adjacent to the little remaining bedrock and to clinker (burned-out bedrock).

Ground water movement through the remaining bedrock is fairly slow (3 to 10 feet/year). At this rate, bedrock ground water contaminated by the Area E spoils has travelled, at most, only about 500 feet east of Area E. Mine spoils water has degraded only 1 observation well in the Rosebud coal seam, and it is located within a few hundred feet of Area E spoils.

Ground water moving through the clinker and into alluvial material could travel at a faster rate and a greater distance because these materials are more permeable than bedrock. However, no wells have been drilled into clinker (which is difficult to drill through), so no information is available to indicate the extent to which mine spoils have degraded alluvial ground water.

2) Surface water and alluvial ground water

Since 1935, when mining began in Area E, ground water passing through mine spoils has been degraded and has seeped into bedrock and alluvial

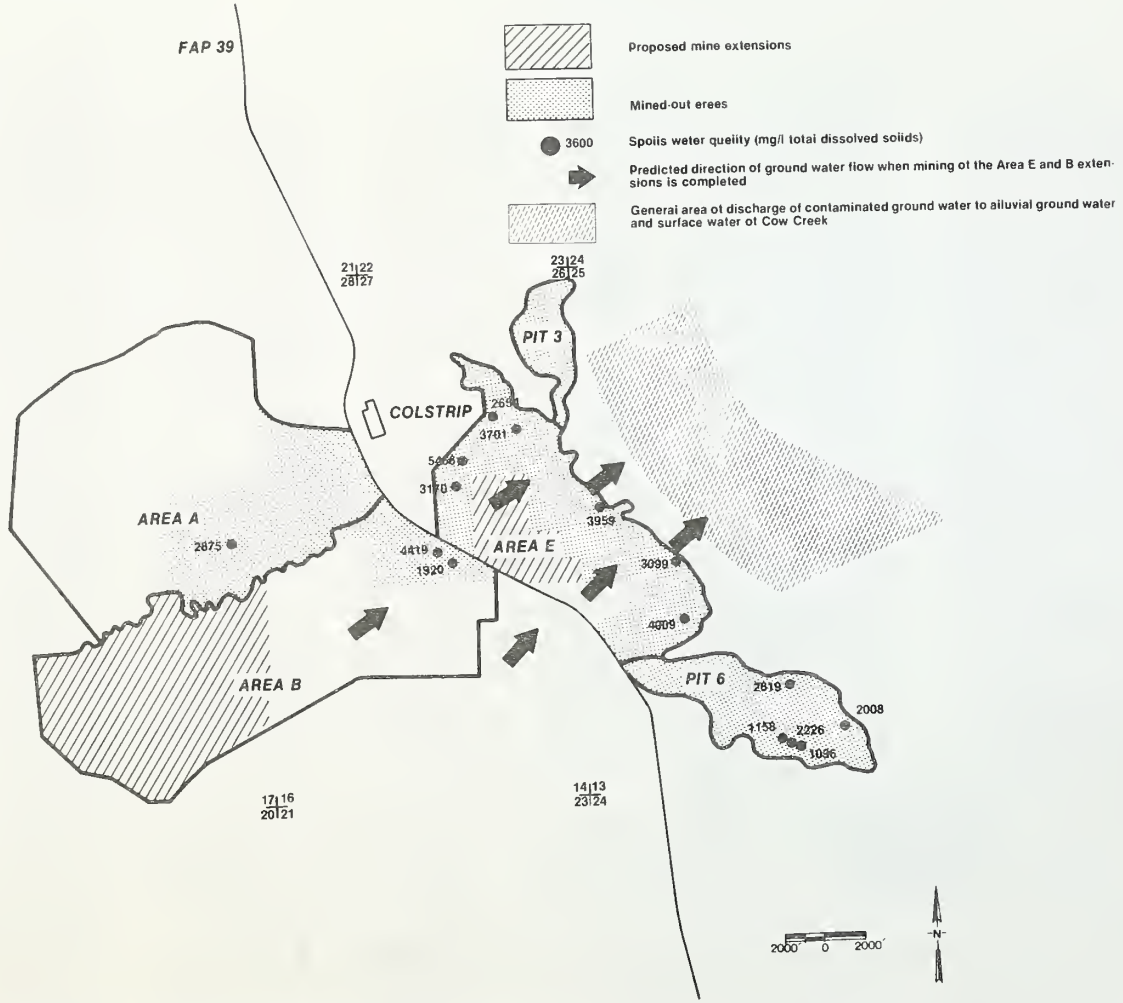

FIGURE II-6.--Existing mine spoil water quality and future flow direction of ground water.

deposits adjacent to the existing Area E mine. The degraded ground water is suspected of contributing to the poor quality water in alluvial wells along two small tributaries that feed into the headwaters of Cow Creek 1.5 miles northeast of Area E. At least one well in South Fork Cow Creek also appears to be affected by mining.

a) Cow Creek

TDS levels in the two wells along the Cow Creek tributaries are 4,340 mg/l (WA-135) and 3,930 mg/l (WA-133) (fig. II-7). Wells in alluvium of other small, nearby drainages of similar size do not exhibit nearly this poor quality of ground water; Pony Creek, 1 mile north of Cow Creek, has a reading of 1,860 mg/l and Emile Coulee, 2 miles south, averages about 2,150 mg/l (Appendix B-2). Mining upgradient of the Cow Creek tributaries may be responsible for their poor quality water, but without water quality data prior to mining, conclusive statements cannot be made regarding what effect mining is actually having on the tributaries. However, because most of the material between the mine spoils and these tributaries is either clinker or alluvium, it is reasonable to assume that mine spoils water could reach the two wells in the 35 to 55 years since the old spoils were created.

b) South Fork Cow Creek

Alluvial ground water in South Fork Cow Creek in an area just east of Area A and Pit 6 appears to be degraded by mine spoil water (fig. II-7). Total dissolved solids in well S-05 (an alluvial observation well located only about 750 feet east of old spoils created in 1945 and 1958) have averaged 5,265 mg/l since 1973 (Appendix B-2), and over 6,000 mg/l in the last two years. TDS levels in alluvial wells in nearby drainages have averaged less than half the levels in S-05. Downstream from well S-05, two other observation wells and a stock pond may be contaminated by spoil water. Concentration of salts due to evaporation probably is the major cause of the very high TDS level in the stock pond (over 7,000 mg/l), although mining upgradient also may be a source.

c) Reduced flood flows

The existing impoundments at Area E and the old mine spoils have decreased the size of flood flows moving down Cow Creek, South Fork Cow Creek, and, to a lesser extent, East Fork Armells Creek. Floods reaching the spreader dike system on Cow Creek are estimated to be about 30 percent less than if the headwaters of Cow Creek had not been mined. This estimate is based on the ratio of the amount of mined lands above the spreader system to the amount of drainage area undisturbed by mining. As a result, both the area that can be flood irrigated and the frequency of flood irrigation may have been reduced by surface water being held in the impoundments and the mine spoils. (Runoff retained in stock watering ponds on some of the tributary ephemerals of Cow Creek may also have the same type of affect on flood flows, but were not included in the estimate.)

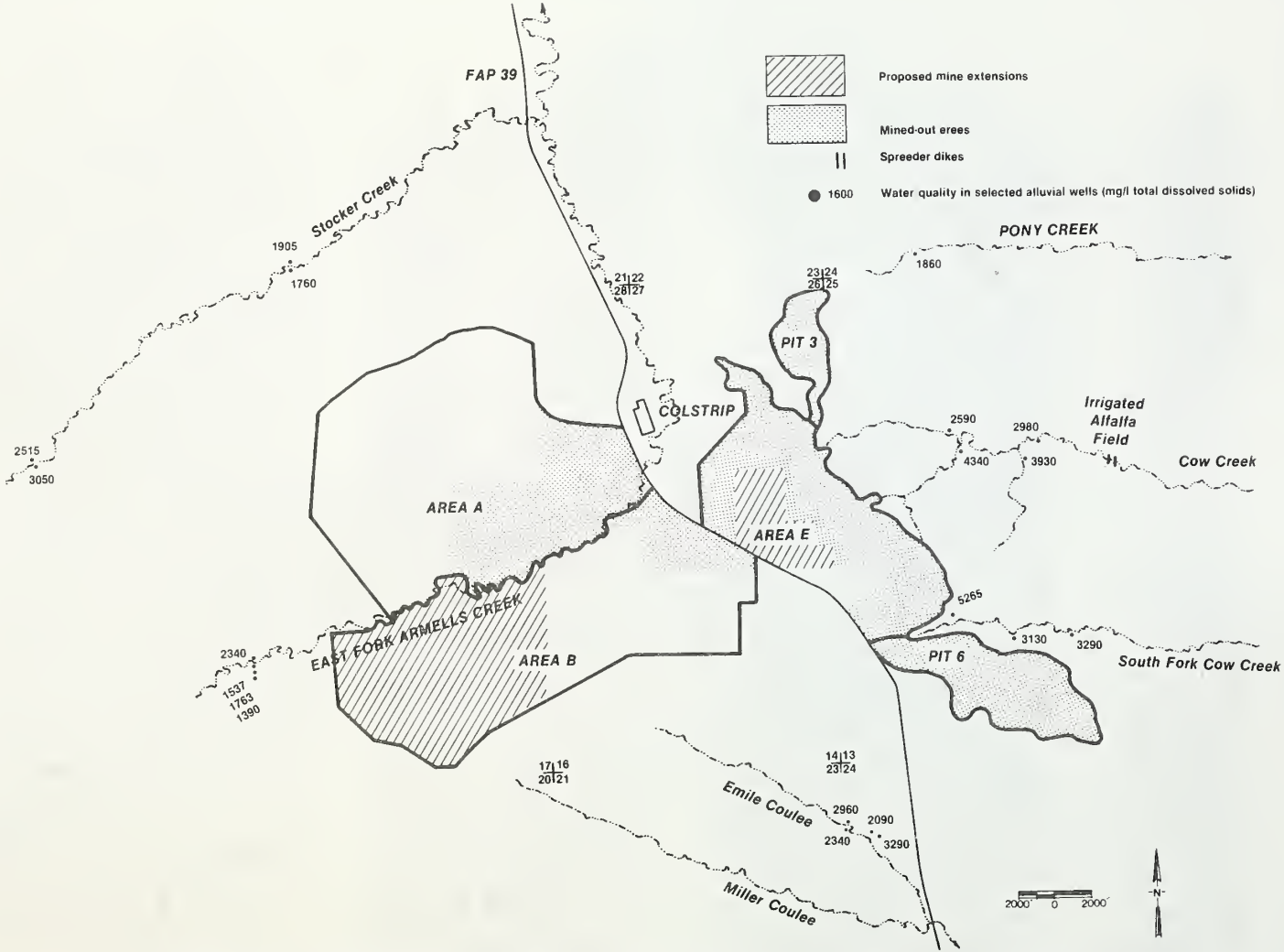

FIGURE II-7.--Comparison of existing alluvial ground water quality of Cow Creek and South Fork Cow Creek with alluvial quality of other drainages near Colstrip.

b. Future impacts of current mining and mining in permitted areas

When current mining in Area E is completed, the rate of ground water movement downgradient through spoils in areas west of Area E and through the Area E mine spoils will increase to approximately the premining rate (3 to 12 gpm). As a result of salts being leached from spoils, TDS levels in ground water passing through the spoils will be 2 to 3 times higher than those in surrounding ground water; roughly 3 to 12 gpm of ground water is expected to be degraded by the existing Area E mine spoils and another 1 to 3 gpm by spoils north of Area E in Pit 3. Most of the ground water eventually will reach the Cow Creek drainage and increase the salt loads of shallow ground water and surface water of Cow Creek, possibly decreasing vegetative productivity in the drainage. This could occur for hundreds to thousands of years.

1) Postmining ground water movement

When mining stops in Areas E and B, ground water will pass through the Rosebud overburden, move downward through the spoils, and accumulate at the bottom. Ground water in the Rosebud aquifer also will enter the mine spoils. Some ground water in the Rosebud and McKay interburden and McKay coal seam (below the mine spoils) also may seep upwards into the spoils. The ground water from these sources would saturate spoils in existing and permitted mine areas to a depth of 10 to 20 feet. The spoils water eventually will move east into adjacent bedrock (Rosebud coal stringer, clinker, Rosebud-McKay interburden, and McKay coal seam). Most of this ground water will evaporate or enter the shallow ground water system of Cow Creek and its tributaries (fig. II-8).

2) Impacts on Cow Creek

Water quality of Cow Creek is naturally poor, especially in its lower reaches, where vegetation along the flood plain reportedly has been damaged by salts carried to the soil surface by shallow ground water. Although mining is not considered a cause of existing saline problems, mining upgradient of Cow Creek is expected to cause problems in the future. Spoils from existing and permitted mining areas probably will add an estimated 5 to 35 percent more salts to the upper third of Cow Creek when mining stops in Area E. The addition of this amount of salts could significantly decrease vegetative productivity along Cow Creek.

The salts probably would not affect productivity of alfalfa fields on the terraces of Cow Creek that are flood irrigated by spreader dikes; when fields are being flood irrigated, runoff volumes will be large enough and the water quality good enough to dilute the salts to harmless levels.

However, native hay fields downstream of the irrigated alfalfa fields could be adversely affected by the additional salts. Salts reportedly are a problem there already (Patty Kluver, oral comm., August 1980). It is difficult to estimate whether or to what extent mining upgradient

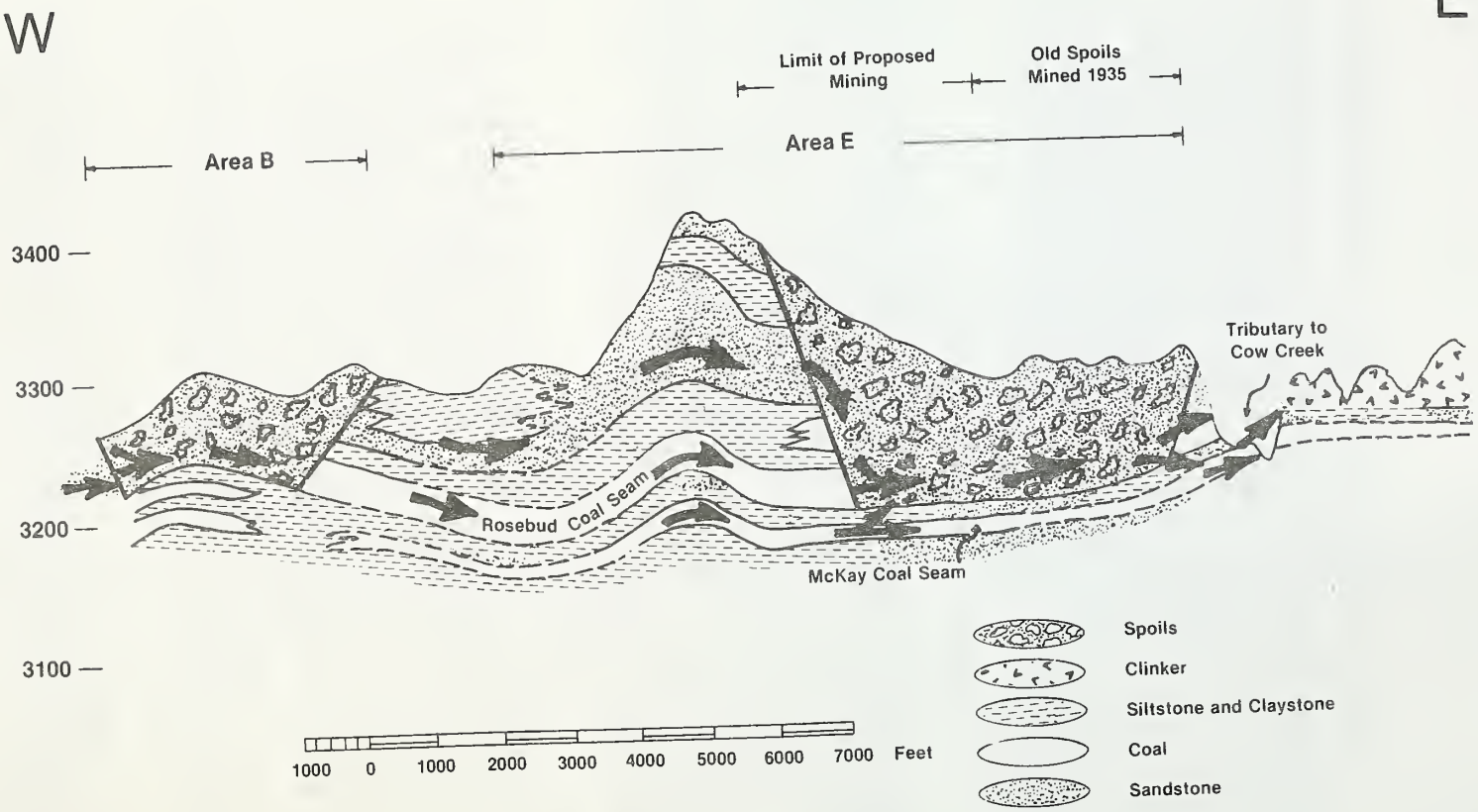

FIGURE II-8.--Movement of ground water through geologic strata* after reclamation of Area E.

*Strata above the Rosebud coal seam are overburden; strata between the Rosebud and McKay seams is interburden.

would further reduce vegetative productivity along this portion of Cow Creek. However, because existing mine spoils are expected to cause noticeable changes in TDS levels of Cow Creek and South Fork Cow Creek, there is a good chance that the vegetative productivity along these streams would be affected.

Existing mine spoils could affect the quality of ponds used for stock watering. One stock pond on South Fork Cow Creek already has TDS levels above 7,000 mg/l; while this high a TDS level cannot necessarily be attributed to mining, the seepage from future mine spoils could add enough salts to make the pond unusable for livestock watering. If new stock ponds were constructed or old ponds reconstructed immediately downgradient of the existing mine spoils, there is a good chance their water would be degraded by mine spoil waters.

At present, there are no stock or domestic wells in areas where ground water will be degraded by mining. Even if new wells are drilled, the ground water may not be degraded enough to be an unacceptable source of water for livestock, unless there were an appreciable amount of evaporation. The degraded ground water would be 2 to 3 times the standard for domestic drinking water; however, ground water in the aquifers that would be degraded most likely would not be used for domestic purposes.

c. Impacts of the Proposal

1) Water quality

The Area E extension would add to the amount of spoils located upgradient of Cow Creek by 11 percent. The salt concentration in the ground water is expected to increase 200 to 300 percent as the water passes through the mine spoils. The level of salts in the upper third of Cow Creek would be increased by an estimated 1 to 4 percent.

Although the size of the Area E extension is small (276 acres) and the amount of salts it would add to Cow Creek would be small, the granting of both this extension and a pending permit application for an Area B extension would expand the size of the entire Rosebud mine considerably (by 42 percent). Thus, the cumulative hydrologic impacts of continued expansion of the entire Rosebud mine would be much more significant than the impacts resulting from mining only in existing and permitted areas.

Mining of the Area E and Area B extensions may increase the mining-related salt load of Cow Creek by as much as 40 percent--an increase roughly proportional to the increased mine acreage. Cumulative impacts on Cow Creek could be even greater if coal is mined from Area D, which also is in the headwaters of Cow Creek (north and east of Area E). Mining in Area D, along with the existing and proposed mining in Areas E and B, could disturb most of the headwaters of Cow Creek, adversely affecting surface runoff.

Increased salt loads in Cow Creek could appreciably reduce the future productivity of native range along the creek; the total mine spoils could contribute enough salts to Cow Creek that alfalfa productivity of the irrigated fields 2 to 3 miles downstream of Area E could be noticably reduced. Other future agricultural uses along Cow Creek also could be affected. Water in potential stock ponds, ground water near the mine, and a spring all could be degraded by mine spoils. The degradation of these waters may not totally preclude future agricultural uses of water east of Area E because other sources of water would be available, but it may be necessary to avoid degraded water when locating new ponds and wells.

Mining-related impacts on Cow Creek could be intensified by existing and proposed flyash ponds associated with Montana Power electrical generating units at Colstrip. Several existing ponds just east and north of Area E are used to store and process brine and ash-laiden water produced as a byproduct of generating units 1 and 2. Ground water below the ponds has been significantly degraded by seepage of poor quality water from the ponds. Some of the degraded ground water could reach the Cow Creek drainage, adding to potential future salinity problems.

Montana Power plans to place a large settling pond for flyash from generating units 3 and 4 in the Cow Creek drainage. The pond ultimately would cover 356 acres and hold 16,500 acre-feet of very poor quality water (up to 29,00 mg/l TDS). Montana Power estimates that the rate of seepage from this pond will be 104 gpm (Sherry Schwend, permit coordinator, written commun., September 9, 1980). This amount of seepage would far exceed the amount expected from mine spoils in Area E, and the quality of water from flyash ponds would be 5 to 6 times more saline than water seeping from mine spoils. Thus, the pond probably would have a considerably worse effect than mining on the quality of water in Cow Creek. The pond seepage also could affect Rosebud Creek, into which Cow Creek empties. However, the Montana Department of Natural Resources and Conservation (the agency responsible for issuing a permit for the flyash pond) will probably stipulate that this rate of seepage will not be allowed because of the adverse impacts it would have on Cow Creek (Gail Kuntz, Chief, Environmental Studies Bureau, DNRC, oral commun., May 1981).

Impacts on East Fork Armells Creek from the expansion of Area E would not be sigificant: the area to be mined is less than 1 percent of the drainage area of East Fork Armells Creek. Cumulative impacts on East Fork Armells from the entire Rosebud mine may be significant: existing mine areas have disrupted approximately 15 percent of the drainage area of the creek, and could eventually disrupt most of the drainage area of East Fork above Colstrip. Surface water impounded in sedimentation ponds may also adversely affect water quality and runoff timing in East Fork Armells Creek, but the effect from Area E would be small--most of the impact would be from Areas A and B. A small amount of contaminated ground water from mine spoils in Area E could eventually surface within East Fork Armells Creek.

2) Water quantity

The mine extension would require that Western Energy leave existing and proposed sedimentation ponds in place for 5 years longer than if the extension were not granted. Surface runoff detained in impoundments at the Rosebud mine must be released within 15 days. This temporary retention would decrease peak flood flows and increase waning flows in Cow Creek, and, to a lesser extent, in East Fork Armells Creek. Some of the runoff would be permanently detained. The 15-day retention of most of the runoff, and the permanent detention of the rest, could possibly affect irrigation practices downstream; however, the effect would be less than at present; Western Energy would no longer be allowed to permanently detain all runoff.

4. Mitigating Measures

To reduce contamination of ground water from saline spoils, Western Energy could be required to selectively place saline spoils above the saturated ground water basal zone. Selective placement of saline overburden has been demonstrated to be effective at nearby Area B. Selective burial alone would increase the cost of overburden replacement about 10 percent; selective burial and capping with clay would increase costs about 50 percent (Dollhopf and others, 1978c).

Two similar methods of selective placement of overburden also could be used to minimize ground water quality degredation. One method would be to isolate overburden either containing salts or possessing the ability to create salts; this material could be selectively placed (by dragline) 15 to 20 feet above the base of the pit. This would keep the material out of the saturated and capillary fringe zones, thereby minimizing ground water degredation (Dollhopf and others, 1979b).

The second approach would be to isolate overburden that has a low salinity value and lacks the ability to create salts. Because sandstone generally does not create salts upon exposure to air (while shale often does), sandstone with low saline values probably would be the best material to place in the pit bottom (Dollhopf and others, 1979b). Review of the lithologic description taken from holes drilled in Area E indicates there would probably be sufficient amounts of sandstone for this purpose.

C. CLIMATE

1. Summary of Impacts

Continued mining in Area E would have no significant impact on the climate. The fugitive emission sources are all at ground level and the emission rates are not of sufficient magnitude to affect either precipitation or radiation balance. Any climate modification at Colstrip would probably be due to the burning of coal in generating units 1-4 instead of

mining activities (U.S. Department of Interior and Montana Department of State Lands, 1980).

2. Description of the Existing Environment

The semiarid climate at Colstrip is indicative of insufficient moisture to sustain dense vegetation growth (Critchfield, 1966) and is typical of the continental steppes of the northern Great Plains. Precipitation is low but variable and falls primarily during the warmer months. Daily temperature variations are large, and seasonal temperature variations are pronounced. Surface humidity is low. The prevailing wind speeds are moderate.

Mean annual precipitation is 15.8 inches, about 50 percent of which occurs from April through June, 20 percent in the winter, and the remainder in the fall. At least 0.01 inches of precipitation falls during 95 days in an average year. Consumptive water use (the total moisture output resulting from soil surface evaporation, plant growth and transpiration) is calculated to be 22.8 inches (Toy and Munson, 1978). Since this exceeds annual precipitation by 7 inches, moisture deficiency affects vegetation development and possibly reclamation success (see Vegetation). Recurrence intervals for 6- and 24-hour precipitation events are presented in table II-3.

Mean annual temperature is about 45°F. Temperatures are lowest in January, with a mean minimum of 8°F., and highest in July, with a mean maximum of 90°F. Relative humidity is highest in winter and lowest in July. The potential growing season, based on the freeze-free period of 115 days, is effectively terminated during midsummer when drought-induced dormancy of vegetation occurs (Toy and Munson, 1978).

Winds from the northwest dominate at Colstrip. Wind from a single 22.5-degree sector persisted for 12 or more hours on only 22 occasions during 1 year of measurement, 50 percent of these occurring during the winter (Super and others, 1973). Average winter wind speed ranges from 14 miles per hour (mph) at a height of 300 feet to 7 mph at ground level. Wind speeds greater than 17 mph occur less than 7 percent of the time. Vertical air movement at Colstrip is characterized by a high frequency of ground-based thermal inversions (Super and others, 1973) and an annual mean maximum mixing depth of 3,414 feet above ground level (Heimbach and Super, 1973).

The regional volume of FES 80-1 (U.S. Department of Interior and Montana Department of State Lands, 1980) and the previous EIS on Area E (Montana Department of State Lands, 1977) contain detailed analyses of the climate at Colstrip. Climatic conditions have important effects on reclamation and revegetation success and on air quality impacts.

3. Impacts of the Proposal--see Summary of Impacts.

TABLE II-3.--Size of largest storm expected at Colstrip during various lengths of time.

Length of event	Size of largest storm (inches)						
	Number of years considered						
	2	5	10	25	50	100	200
6 hours[1]	1.00	1.30	1.60	2.00	2.20	2.40	-
24 hours[2]	1.25	1.74	2.04	2.38	2.62	2.83	3.03

[1]Values taken from Miller and others (1973).

[2]Values calculated from precipitation records at Colstrip, 1948-1976.

D. AIR QUALITY

1. Summary of Impacts

Particulate and gaseous emissions from Area E would continue to contribute slightly to the significantly reduced air quality at Colstrip. Increases in ambient particulate and gaseous pollutant concentrations would be primarily caused by construction of Colstrip units 3 and 4, not continued mining in Area E.

2. Description of the Existing Environment

Air quality in the town of Colstrip does not meet the National Ambient Air Quality Standards (NAAQS) because of high concentrations of total suspended particulate (TSP). Because of this, the U.S. Environmental Protection Agency has designated a nonattainment area comprising 120 square miles centering on Colstrip. Western Energy Company petitioned the designation in December, 1979; however, the Montana Air Quality Bureau determined the application was incomplete. Western Energy Company is in the process of responding to the deficiency letter. Monitoring data indicate that elevated TSP concentrations occur only in the town of Colstrip and adjacent to the mining areas, not in the entire nonattainment area. The high TSP concentrations in the town and mining areas result almost entirely from mining and construction, power plant operation, motor vehicle traffic, and wind erosion of exposed areas, primarily from exposed overburden. Wind erosion from cropland and rangeland is minimal (Dennis Loreth, District conservationist, Forsyth, oral commun., May 5, 1980). The Montana Power Company (MPC) #1 high volume air sampler (hi-vol) 1.5 miles north of Colstrip showed a TSP geometric mean concentration of 20.2 ug/m^3 during 1973-1979. This site is upwind of the town and mining operations and is therefore not heavily influenced by activities in those areas. The Burlington Northern (BN)

site maintained by the Montana Air Quality Bureau (AQB), 2.5 miles southeast of Colstrip at 200-250 feet above ground level, showed a TSP geometric mean concentration of 21.8 ug/m^3. The McRae site, 14.5 miles southeast of Colstrip, showed TSP geometric mean concentration of 14.5 ug/m^3 for the years 1974-1979. Even though the BN and McRae sites are downwind of the town and mining activities, the TSP concentrations are similar to those measured upwind of the mining activities (table II-4) and similar to the 21.1 ug/m^3 measured in areas of Montana considered to be pristine (U.S. Department of the Interior and Montana Department of State Lands, 1980).

Within a radius of 1.5 miles from Colstrip, an area of about 7 square miles, TSP concentrations are much higher than the background level of 10-20 ug/m^3. Results from monitoring station MPC #3, located in the center of Colstrip, show that the NAAQS for TSP were exceeded repeatedly during 1974-1979. The TSP annual geometric mean exceeded the primary NAAQS (75 ug/m^3) 5 of the 6 years; the 24-hour standard (260 ug/m^3; not to be exceeded more than once per year) was exceeded 4 of the 6 years. The source of this particulate is a combination of coal mining and handling, power plant operation, wind erosion of exposed areas, construction activities, and dust from paved and unpaved roads. Although particulate emissions from these sources can be estimated, the percentage contribution of each to the ambient TSP concentrations is not known.

No adverse human health effects have been reported from exposure to TSP concentrations of 86 ug/m^3 (Montana Department of Health and Environmental Sciences, 1980), which was the TSP geometric mean concentration in Colstrip during 1974-1979. These concentrations do indicate a potential human health problem, especially under long term exposure. Further dust suppression measures would reduce the potential for respiratory disease (see section 4, Mitigating Measures).

Very high TSP concentrations have also been recorded on the area A permit areas downwind of the mine and the coal handling facilities (table II-4; sites WECo 3 and WECo 4). Because these concentrations are measured in areas to which the general public does not have access, the NAAQS do not apply. Workers sporadically have been exposed to levels that exceed the Mine Health and Safety Administration (MSHA) standard of 2000 ug/m^3 for an 8-hour shift. This indicates a potential health problem even though none has been reported: exposure to respirable coal dust in surface mining operations may cause coal worker's pneumoconiosis (CWP) in a small percentage of the workers. Those working in jobs known to produce the highest concentrations of respirable coal dust (cleaning, drilling, welding and tipple work) have a greater chance of developing CWP (Fairman and others, 1977).

Construction of Colstrip units 3 and 4 will be a major but temporary source of particulate and gaseous pollutants. During the estimated construction period of 50 months, particulate and gaseous emissions could average up to 1,500 tons/year and 1,000 tons/year respectively. However, these emissions are not expected to present a significant health hazard (on-file report, Montana Department of State Lands).

TABLE II-4.--Total suspended particulate concentrations at Colstrip

[Location is in relation to Colstrip]

Site Location	MPC 1 1 Mile N			MPC 3 Center Of Town			WECo 3 2.1 Miles SW			WECo 4 1.7 Miles SW			BN 2.5 Miles SE			McRea 14.5 Miles SE		
	AGM[1]	2nd Max.	High	AGM	2nd Max.	High	AGM	2nd Max.	High	AGM	2nd Max.	High	AGM	2nd Max.	High	AGM	2nd Max.	High
1974	21	93	79	115	612	515	---	---	---	---	---	---	13	119	57	12	63	60
1975	19	120	112	86	413	382	---	---	---	---	---	---	19	129	109	9	59	49
1976	28	121	112	103	428	412	---	---	---	---	---	---	28	104	92	17	86	86
1977	18	250	98	79	378	245	106	741	664	44	422	342	25	95	71	17	102	36
1978	15	115	93	59	361	255	92	2150	546	51	1080	480	17[a]	138[a]	112[a]	---	---	---
1979	34	135	119	89	442	339	163	916	810	360	4430	2870	35[b]	174[b]	165[b]	20[b]	69[b]	54[b]

[1]Annual geometric mean.
[a]For period June through August and October through December, 1978.
[b]For period January through September, 1979.

3. Impacts of the Proposal

Fugitive dust emissions from continued mining in Area E would continue at present rates. The emissions would be composed of coal dust, topsoil and overburden particles, and gasoline and diesel fuel combustion particulate (table II-5).

The major sources of coal particulate would be vehicle traffic, primarily crawler-dozer activity around the surge pile and the coal handling facilities, which would account for 44 percent and 35 percent, respectively, of total controlled coal dust emissions. Coal drilling, dumping, and removal (table II-5) would contribute minor amounts of coal dust.

Wind erosion of exposed areas and overburden removal are the major sources of non-coal particulate (listed as "other" in table II-5). Due to the high silt content of the overburden (40 percent), overburden particles are easily suspended by wind and dragline activity. These activities are responsible for 66 percent of the controlled non-coal emissions. Topsoil and subsoil removal and replacement and haul road traffic account for 31 percent of the 845 tons emitted annually. Other than reducing the fall distance during overburden removal, there is little that could be done to further reduce these emissions.

Only during the warmer months when the winds are from the southeast would residents of Colstrip be exposed to dust originating from Area E. At present it is not possible to predict to what extent dust from Area E contributes to the TSP concentrations measured in the center of town. The contribution is probably much less than that from construction activities and other coal handling facilities.

Particulate and gaseous emissions from gasoline and diesel fuel combustion (tables II-5 and II-6) are not major and would not affect the air quality at Colstrip.

Particulate and gaseous emissions would end with the cessation of mining at Area E. If reclamation were not successful, as might happen in a prolonged drought, topsoil loss due to wind erosion could continue at rates of 5 tons/acre/year (Bohn and Cowherd, 1977, assuming a silt content of 16.5 percent in surface salvage material) indefinitely--a total of 2,250 tons of particulate emissions per year from the 450-acre permit area.

4. Mitigating Measures

Coal dust emissions could be substantially reduced by watering the coal storage pile and using a baghouse in conjunction with the coal handling facilities (table II-5). Watering the storage pile would reduce coal particulate emissions from the pile by 50 percent to an average of 87 tons/year. Installing a baghouse plus fully covering all conveyors and transfer points would eliminate coal dust emissions from those sources.

TABLE II-5.--Estimated potential and controlled particulate emissions from Area E

Activity	Extent of activity per year	Emission factor	Uncontrolled emissions (tons/year) Coal	Other particulate	Ref.	Control proposed by Western Energy	% control	Controlled emissions Coal	Other	BACT control strategy	% control	with BACT (coal)
Topsoil and subsoil removal	407,100	0.38 lbs/yd^3		77	1	---	---		77	---	---	
replacement	407,100	0.38 lbs/yd^3		77					77			
Exposed areas	103.2 acres	12.2 tons/acre		1255	4	Revegetation within one growing season	75		314	Revegetation within one growing season	75	
Overburden drilling	2,227 holes	1.5 lb/hole		1.7	1	---	---		1.7	Bag collector on air drill	90	
Overburden blasting	64 blasts	14.2-85.3 lb/blast		0.4-2.7	1	---	---		0.4-2.7	---	---	
Overburden removal	16.4 x 10^6 yd^3	0.0056-0.053 lb/yd^3		46-435	1	---	---		46-435	---	---	
Coal drilling	7,238 holes	0.22 lb/hole	0.8		1	---	---	0.7	---	Bag collector on air drill	90	0.1
Coal blasting	302 blasts	25.1-78.1 lb/blast	3.8-12		1	---	---	3.8-12	---	---	---	3.8-12
Coal removal	3.1 x 10^6 tons	0.0035-0.014 lb/ton	5.4-22		1	---	---	5.4-22	---	---	---	5.4-22
Haul road traffic	171,880 vmt	8.48 lb/vmt		728	1	Treatment with $CaCl_2$	85		109	Treatment with $CaCl_2$	85	
Coal dumping	3.1 x 10^6 tons	0.007-0.027 lb/ton	11-42		1	---	---	11-42	---	Negative pressure system	85	1.6-6.3
Coal screening	3.1 x 10^6 tons	0.1 lb/ton	155		1	Enclosed	50	78	---	Baghouse	99	1.6
Coal crushing primary	3.1 x 10^6 tons	0.02 lb/ton	31		1	Enclosed	50	14	---	Baghouse	99	0.3
secondary	936,000 tons	0.06 lb/ton	28		1	Enclosed	50	16	---	Baghouse	99	0.3
Conveyors and transfer points	3.1 x 10^6 tons	0.2 lb/ton	310		1	Partially covered	90	31	---	Fully covered	100	0
Train loading	600,000 tons	0.0002 lb/ton	0.1		1	---	---	0.3	---	Retractable chute	95	0
vehicle traffic around storage pile	continuous	0.02-0.26 lb/ton	25-325		6	---	---	25-325	---	Water	50	12.5-162
Surge pile	1.6 surface acres	u = 3.3 m/sec 1.6u lb/hr	37		1	---	---	31	---	Enclosed	99	0.3
Coal stacker	2.5 x 10^6 tons	0.0003-0.0011 lb/ton	0.4-1.4		6	Partially enclosed		?		Enclosed	99	0
Diesel fuel	675,000 gallons	23.7 lb/10^3 gal		8.0	2		---		---			
Gasoline	48,000 gallons	12 lb/10^3 gal		0.3	2	---	---		8.0	---	---	
Unit trains	60					---	---		0.3	---	---	
distance traveled	240 roundtrip Colstrip-Billings	0.8 lb/mile		5.8	3	---	---		5.8	---	---	
Coal transported	600,000 tons	Unknown	Unknown			---	---	---	---	---	---	---
Mine-associated population	180	0.06 tons/person/yr.		10.8	5	---	---		10.8			
		Total	608-964 (avg.) 786	2,210-2,601 (avg.)2,406				222-578 (avg.)400	650-1,041 (avg.)845			26.1-205 (avg.) 116
		Percent control						49.1	64.9			85.2

[1]U.S. Environmental Protection Agency (1979).
[2]U.S. Environmental Protection Agency (1976).
[3]Hugh Williams, Burlington Northern Inc., written commun., May 23, 1980.
[4]Bohn and Cowherd (1977).
[5]U.S. Environmental Protection Agency (1973).
[6]Bohn, Cuscino, and Cowherd (1978).

TABLE II-6.--Gaseous emissions (tons/year) from mining at Area E

Activity	Annual extent	NO_x	SO_x	HC	CO	Alde-hydes	Organic Acids	HCN	Ref.
Blasting (ANFO)[a]	2,200 tons	3.52	-	-	46.9	-	-	0.1	1
Unit trains	14,400 miles	118.0	13.0	4.3	15.8	1.3	1.6	-	2
Diesel fuel	675,000 gallons	141.0	10.5	14.2	33.2	3.3	-	-	3
Gasoline[b]	48,000 gallons	8.1	0.2	8.6	109.0	-	-	-	3
Mine-associated population	180 persons	30.6	12.6	23.4	61.2				4
Total		301.0	36.3	50.5	266	4.6	1.6	0.1	

[1]Chaiken and others (1974).
[2]Hugh Williams, Burlington Northern Inc., (written commun.) May 23, 1980.
[4]U.S. Environmental Protection Agency (1973).
[a]Ammonium-nitrate fuel-oil mixture.
[b]Assumes 12 miles/gallon.

In total, if all the Best Available Control Technology (BACT) measures were implemented, coal dust emissions would be reduced from 400 tons per year to 116 tons per year, a 71 percent reduction (see table II-5). This would reduce potential health hazards to mine workers but would only slightly reduce ambient particulate concentrations at Colstrip.

Western Energy Company is presently using the BACT for the reduction of fugitive noncoal dust emissions (table II-5; U.S. Environmental Protection Agency, 1979). Minimization of the fall distance from the dragline during overburden replacement could reduce dust somewhat.

E. SOILS

1. Summary of Impacts

Impacts on soils would not be significant because the proposed soil salvage plan and complex slope system would prevent excessive loss of soil during and after mining. Revegetation success could be further enhanced by additional soil sampling prior to stripping in order to salvage only the most suitable soil material.

2. Description of the Existing Environment

Most of the soils in the proposed permit area are moderately well developed with small areas of well developed and poorly developed soils (table II-7). The soils in the permit area formed from materials ranging from alluvium to sandstone, siltstone, and shale.

Capability groupings (U.S. Department of Agriculture-Soil Conservation Service, unpublished soil survey, Rosebud County Area) indicate that approximately 364 acres (81 percent of total permit area) are suitable for cultivation with severe (Group III) or very severe (Group IV) limitations. Approximately 29 acres (6 percent of total permit area) are suitable for use as rangeland (Groups VI and VII). The remaining 57 acres (13 percent of total permit area) are occupied by rock outcrops and minor soil inclusions. None of the soils in the permit area meet the criteria for prime farmland. Erosion is a major factor limiting land use. This limitation is a result of dissected topography, large areas with sandy textures, and periodic drought.

3. Impacts of the Proposal

Some impacts on the soils of the proposed permit area are unavoidable. These impacts include loss of the natural soil profile, soil structure, organic matter, pore space, and pore continuity. Because of these impacts, this area would probably be more sensitive to mismanagement and drought than before disturbance, for perhaps several decades after mining. Long term impacts (more than several decades after mining) are uncertain since there is not enough information to determine all the conditions and practices required for long term success. Complete revegetation failure is unlikely (see Vegetation).

TABLE II-7.--Soil resources in proposed disturbance area of section 2 of Area E

Soil Series	Subgroup	Acres	Approximate Soil Salvage Volume (acre-feet) Proposed	Potential	Primary Limiting Factor	Average Surface Texture (0-6")* %Sand/%Clay		Average Subsurface Texture (>6")* %Sand/%Clay	
Busby	Borollic Camborthids	196.1	532.3	532.3[c]	Texture	72/9	(SL)	68/10	(SL)
Chinook	Aridic Haploborolls	58.9	147.3	147.3[c]	Texture	71/12	(SL)	63/13	(SL)
Kremlin	Aridic Haploborolls	25.9	103.6	77.7[c]	Excess Salts	38/25	(L)	31/29	(CL)
Yamac	Borollic Camborthids	79.2	396.1	198.0[c]	Excess Salts	43/31	(CL)	24/35	(CL)
Cabbart	Ustic Torriorthents	17.3	34.7	25.9	Bedrock	29/33	(CL)	21/31	(CL)
Vanstel	Borollic Haplargids	3.7	7.4	9.3[c]	Excess Salts	31/27	(L/CL)[b]	13/40	(SiCL/SiC)[b]
Yawdim	Ustic Torriorthents	11.5	23.1	11.5[c]	Bedrock/Clay	44/31	(CL)	14/39	(SiCL)
	Totals	392.6[a]	1,244.5	1,002.0					

[a]The remaining 57.4 acres of total 450 acres to be disturbed are composed of soil mapping unit inclusions and rock outcrops.

[b]Borderline textures.

[c]Soil profiles for these series are variable. Potential salvage volumes are subject to change following additional sampling.

*U.S. Department of Agriculture textural classes:

C = Clay
CL = Clay Loam
L = Loam
LS = Loamy Sand
SL = Sandy Loam
SCL = Sandy Clay Loam
SiCL = Silty Clay Loam
SiL = Silt Loam
SiC = Silty Clay

Western Energy's proposed reclamation plan would salvage a sufficient volume of soil material and prevent excessive erosion. Because of this, the potential for successful revegetation would be increased.

To prevent the destruction and loss of soil material in the permit area, Western Energy proposes to salvage 1,244.5 acre-feet of soil material from 392.6 acres (table II-7). An unknown additional amount of soil material would be salvaged from associated soil inclusions in the remainder of the 450-acre permit area. This would provide an average minimum cover depth of about 33 inches for the permit area, which is greater than that necessary for adequate biomass production. Recent studies by the Colorado School of Mines Research Institute (1980) demonstrate that perennial grass production consistently increases as salvaged soil depth increases from 0 to 70 cm (28 inches). In addition to the increase in biomass, the water infiltration rate and the rooting depth also increase with an increase in soil thickness.

Proposed and potential approximate soil salvage volumes are presented in table II-7. Duplicate samples of Busby and Chinook soils taken at similar depths show variable texture: one sample for each series is excessively sandy and one sample is not. Samples of Yamac and Vanstel soils at similar depths show similar variability in electrical conductivity (EC--a measure of salt content), with one sample for each series excessively saline and one sample not. Because of this variability among duplicate soil samples, it is not possible to determine whether Western Energy's proposed salvage depths are appropriate. The company has agreed to take additional samples of the Busby, Vanstel, and Chinook series before stripping and analyze them on-site to determine appropriate salvage depths. DSL will require this procedure for the Kremlin and Yamac series.

For the Cabbart and Yawdim soils, salvage would be limited by bedrock at an average of 18 inches and 12 inches, respectively. Western Energy proposes to salvage those soils to greater depths than practical (see table II-7). DSL could require the company to salvage the Cabbart and Yawdim soils only to bedrock (see Mitigating Measures).

Based on the limited soil samples available, it appears that there would be sufficient soil to allow adequate vegetative growth without salvaging excessively sandy and saline materials. At worst, if the more limiting value of the duplicate samples were verified by additional sampling, roughly 500 acre-feet of soil would be salvageable. This would cover the regraded spoils to a depth of about 15 inches, which would be sufficient to allow adequate vegetation growth, because the overburden in this area is not expected to present much of a problem (see Geology). The required additional sampling would probably delineate much more than 500 acre-feet of salvageable soil, however.

By stripping ahead of the active pit in the summer and fall and immediately redistributing the soil material on the regraded spoils, Western Energy will refrain from stockpiling soil material. This will prevent the increase in bulk density (decrease in porosity), decrease in

water holding capacity, reduction in the amount of organic matter, and decrease in soil microorganisms found in stockpiled soils (Miller and Cameron, 1976).

Approximately 65 percent of the soils in the permit area contain sand slightly in excess of 70 percent. Fine and very fine sand, which is dominant in these soils, is easily entrained by running water. A small amount of runoff occuring as the result of high intensity storms can cause severe erosion (Schafer and others, 1979). Rapid establishment of vegetation is extremely important in this area. To minimize erosion Western Energy will reconstruct slopes to a complex configuration, seed immediately after the soil material is redistributed (see Vegetation), and apply mulch.

Regraded slopes will range from 5 to 20 percent, averaging 10 percent (see fig. II-3). A 20 percent slope roughly 600 feet long in the northwest part of the permit area would be most subject to erosion. If left bare, erosion rates on this slope could exceed 32 tons/acre/year until the vegetation begins to grow, based on the Universal Soil Loss Equation (U.S. Department of Agriculture and U.S. Environmental Protection Agency, 1977). This would be unacceptably high. To minimize this erosion loss, the company will apply straw mulch at a rate of 1.5-2.0 tons/acre. This will reduce the erosion loss to approximately 3.2 tons/acre/year, a decrease of 90 percent, based on the same equation. This loss is just slightly higher than the "permissable" temporary soil loss of 3 tons/acre/year established for this depth of soil material (U.S. Department of Agriculture, Soil Conservation Service, 1973). To further minimize erosion problems, Western Energy is proposing a complex slope design. For the most part, this design is basically concave, with a small convex area near the top. Such a design has been shown to be least affected by erosion, yield the least amount of sediment, and change shape slower than other designs (Schafer and others, 1979).

4. Mitigating Measures

Western Energy currently plans to salvage the Cabbart and Yawdim soils to a depth greater than the average soil thickness. This would result in taking siltstone and shale bedrock material, which is not suitable for plant growth. DSL could require the company to salvage those series only to bedrock.

F. VEGETATION

1. Summary of Impacts

Impacts on vegetation would not be significant because Western Energy would make maximum feasible use of the reclaimed soil's potential to support diverse native vegetation. Unavoidable disturbance of the soil would probably cause a slight reduction in potential productivity, but this would not limit normal use of the reclaimed minesite for domestic livestock production and wildlife habitat.

2. Description of the Existing Environment

The vegetation of the proposed permit area consists of a variety of native range plant communities as well as some disturbed areas (table II-8). The native plant communities are typical of the rangeland of eastern Montana. A vegetation map, which includes the proposed permit area, can be found in the previous EIS on Area E (Montana Department of State Lands, 1977).

The area to be mined has clusters of ponderosa pine (Pinus ponderosa) and associated shrubs on the ridge tops, various native shrubs, forbs, and grasses occupying the draws and lowland drainage areas, and native range grasses (with scattered shrubs and forbs) on both upper and lower slopes. Western Energy consultants have mapped 12 vegetative community types on the proposed permit area (Ecological Consulting Service, 1975b). These vegetative communities include 2 disturbed grassland types. One of the disturbance types is composed mainly of cheatgrass (Bromus tectorum), which was reported to be the result of overgrazing (Ecological Consulting Service, 1975b). The other disturbance type (designated as "disturbed grassland" in table II-8) is the result of direct disturbance by man in the past by plowing. Complete vegetative community descriptions and productivity data for the vegetative community types listed in table II-8, as well as a comprehensive plant species list for the entire Colstrip area, can be found in the previous EIS on Area E (Montana Department of State Lands, 1977).

The range conditions for the native vegetative community types are given in table II-8 (Ecological Consulting Service, 1975b). Overall, the range condition of the proposed permit area is fair (productivity level 26 to 50 percent of climax vegetation). At present, the total stocking rate for the entire 450-acre permit area is 115 cow/calf units for a 1-month grazing period, or approximately 11.5 cow/calf units for a 10-month grazing period. The potential stocking rate for the entire permit area is 189 cow/calf units for a 1-month grazing period, or 18.9 cow/calf units for a 10-month grazing period (U.S. Department of Agriculture-Soil Conservation Service, 1978).

3. Impacts of the Proposal

Western Energy's proposed revegetation plan, in combination with proper postmining slope design (see Geology) and soil handling procedures (see Soils), would maximize the potential for vegetative reclamation at Area E. Although reclamation success is not guaranteed, the revegetation plan would have a good chance of establishing a diverse native vegetation cover composed of plant species desirable for domestic livestock and wildlife.

All vegetation would be removed from active mining areas. After regrading and topsoiling, the mined area would be reseeded and mulched. The proposed seeding mixture is shown in Appendix F-1. For several decades after mining, reclaimed land would probably not sustain as high

TABLE II-8.--Vegetative communities, acres, range sites, condition, and stocking rates at Area E

[Source: Ecological Consulting Service, 1975]

Code No.	Vegetative Community	Acres	Range Site[1]	Range Condition	Recommended Stocking Rate[3]	Potential Stocking Rate[5]
111.2	Agropyron smithii-Koelaria cristata-Carex filifolia	32.9	Silty	Fair (47)[2]	.30 (9.9)[4]	.53 (17.4)[4]
111.3	Stipa comata-Carex filifolia-Koelaria cristata	46.5	Silty	Fair (32)	.30 (14.0)	.53 (24.6)
111.4	Calamovilfa longifolia-Andropogon spp.	19.2	Sandy	Good (70)	.45 (8.6)	.53 (10.2)
111.5	Bromus tectorum	5.8	---	---	---	---
211	Artemesia tridentata-Koelaria cristata-Agropyron spicatum	62.8	Clayey	Fair (31)	.30 (18.8)	.53 (33.3)
212.1	Artemesia cana-Agropyron smithii-Stipa viridula-Poa spp.	10.2	Overflow	Good (55)	.60 (6.1)	.61 (6.2)
212.2	Artemesia cana-Agropyron smithii-Stipa smithii	117.8	Silty	Fair (41)	.30 (35.3)	.53 (62.4)
213	Rhus trilobata-Stipa comata-Agropyron smithii	39.7	Sandy	Fair (37)	.30 (11.9)	.53 (21.0)
214	Chrysothamnus nauseosus-Agropyron spicatum-Oryzopsis hymenoides	13.4	Dense Clay	Poor (16)	.10 (1.3)	.35 (4.7)
351	Pinus ponderosa-Agropyron spicatum	16.5	Thin-hilly	Excellent (76)	.50 (8.3)	.50 (8.3)
352	Pinus ponderosa-Juniperus scopulorum Agropyron spicatum	2.0	Thin-hilly	Fair (49)	.25 (0.5)	.50 (1.0)
651	Disturbed grassland	79.6	---	---	---	---
653	Corral sites	1.5	---	---	---	---
S	Sandstone outcrops	2.1	---	---	---	---

[1]Follows U.S. Soil Conservation Service (SCS) criteria.
[2]Percent of climax vegetation--poor: 0-24; fair: 25-49; good: 50-74; excellent: 75-100.
[3]For existing range condition; units are AUM's/acre (animal unit months/acre).
[4]Number in parentheses is total AUM's (AUM's/acre multiplied by the acres in each vegetative community).
[5]Based on an average of 100% and 75% potentials for each range site (from SCS Montana Grazing Guides).

a grazing pressure as what could have been achieved before mining under optimum management. That potential ranges from .35 to .61 AUM/acre, depending on community type, for a weighted average of .42 AUM/acre. This slight reduction in optimum grazing potential would occur because of the unavoidable impacts on soils (see Soils). The condition of the reclaimed land would, however, be better than its current (fair) condition. This is based on grazing trials at Area A, where the postmining stocking rate is roughly double the premining rate (Earl Murray, Western Energy Company, oral commun., January 21, 1981).

Vegetation on reclaimed land would probably be more sensitive to mismanagement and drought than on undisturbed land, again owing to unavoidable impacts on soils.

Western Energy has met with limited success in reestablishing trees, shrubs, and forbs in reclamation areas at the Rosebud mine, owing to competition for moisture from native grasses. Further problems have resulted from the destruction of reestablished native grasses by the machinery (tree spade, etc.) needed to plant shrubs and trees. To avoid problems of this type, Western Energy proposes to plant a temporary stabilizer crop of wintergraze to prevent excessive erosion in areas where shrubs, trees, and forbs are desired. After the wintergraze is established trees, shrubs, and forbs will be planted. Planting of native grasses in these areas will be delayed for one or two growing seasons to allow the trees, shrubs, and forbs to become established. Using this procedure Western Energy would likely be able to establish a diverse vegetative cover. Wintergraze is an annual species and will not compete as well as native grasses for moisture. The wintergraze will not be part of the permanent vegetation; therefore, long term impacts as a result of the destruction from planting machinery will be minimal.

After the native vegetation has become established, Western Energy (with DSL approval) will incorporate a planned grazing system to compensate for the grazing preferences of livestock. Planned grazing systems reduce overuse by livestock of preferred plant species and the underuse or nonuse of other species in the vegetative community.

Native vegetation in the Colstrip area contains adequate nutrients for plant growth (Munshower and DePuit, 1976).

Phosphorus levels in the native grasses of this area are usually below requirement levels for all classes of range cattle--the common practice of feeding phosphorus supplements in this area is well founded (Munshower and others, 1977).

Molybdenum (Mo) has been known to accumulate in legumes in the Colstrip area (Erdman, 1978). This could create copper (Cu) deficiency symptoms in livestock because of a Cu:Mo imbalance. The revegetation seed mixtures do not contain a significant amount of legumes, therefore, copper deficiency problems are not expected (see Geology, section 2b, Overburden).

G. WILDLIFE

1. Summary of Impacts

Continued mining at Area E would not have significant long term impacts on wildlife because Western Energy would reestablish wildlife habitats similar to those that existed before mining.

2. Description of the Existing Environment

The proposed permit area is essentially an island of undisturbed native vegetation surrounded by operating mine machinery on three sides and highway FAP 39 to the south. The mine machinery includes draglines, scrapers, front-end loaders, and trucks traveling along adjacent access roads. Highway FAP 39 has right-of-way fencing on both sides. Because of these disturbances, the permit area presently contains no major use for wildlife. Use is restricted to a few small mammal species, songbirds, and possibly occasional game birds.

Wildlife observations and census data presented in this statement were collected by Western Energy consultants for various study areas that included Area E (Ecological Consulting Service, 1973, 1975a, 1976, 1977, 1978, 1979). By use of these wildlife inventory data and corresponding vegetative habitat types, a prediction can be made as to what species of wildife common to the Colstrip vicinity would use the permit area if there were no surrounding disturbances. This is done by comparing vegetative habitat types that presently exist in the permit area with those of adjacent areas. For example, Ecological Consulting Service sighted mule deer mostly in the sage-grassland, skunkbush sumac-grassland, and ponderosa pine-grassland habitat types; therefore, mule deer would probably be periodically found on similar habitat types in the permit area if the adjacent disturbances did not exist. Table II-9 lists wildlife species and the percentage of the 450-acre permit area that is their most common habitat. This serves as a basis for comparison with postmining habitat types (see following impacts section). The previous EIS on Area E (Montana Department of State Lands, 1977) discusses in greater detail the habitat preferences of species found on and near the permit area.

3. Impacts of the Proposal

The remaining undisturbed wildlife habitat at Area E would be mined out by about 1985. This habitat, however, is little used by wildlife owing to the surrounding mining-related disturbance. For this reason the habitat lost during mining would affect only species that are common in the Colstrip area, such as small mammals, songbirds, and possibly a few game birds.

Impacts on wildlife following reclamation would be insignificant because Western Energy proposes to reestablish habitat types similar in vegetative communities and area to the present native communities (see Vegetation). For example, approximately 55 percent of the present area

supports vegetative communities commonly used by mule deer. Assuming successful revegetation, which appears likely (see Soils and Vegetation), approximately 65 percent of the postmining area would have vegetative communities that are commonly used by mule deer (table II-9). For other game and nongame wildlife species, the revegetated plant communities would be roughly equal or greater in area than the original plant communities (table II-9). An increase in habitat area for one wildlife species does not indicate a decrease for another species, because the proposed permit area contains 85 disturbed acres that would be used for establishment of vegetative communities useful to various wildlife species. Therefore, an increase in animal habitat area is feasible.

In the Colstrip area, raptors normally nest in cavities of ponderosa pine snags or sandstone outcrops and bluffs (Ecological Consulting Service, 1979). No active raptor nests are known in the area to be mined. Western Energy proposes to replace the small areas of ponderosa pine now found on Area E, which would eventually provide nesting sites for raptors as the trees grew to maturity. In addition, Western Energy will attempt to simulate the sandstone outcrops and rocky knobs presently in the area. During or immediately following soil salvage around the outcrops, front-end loaders or trucks will be used to remove the exposed sandstone to a size limited by equipment capabilities. The sandstone will be relocated on regraded knobs or ridgetops after topsoil redistribution. Although these outcrops are probably not large enough for raptor nests, the outcrops will provide a good microhabitat for small mammals and reptiles which are prey for raptors.

No threatened or endangered species are known to use the permit area, so none would be adversely affected by approval of the permit. Area E may have been habitat for the golden eagle before mining began (see table II-9), but the company will attempt to reestablish ponderosa pine, which when mature are potential habitat for golden eagles.

H. SOCIOLOGY

1. Summary of Impacts

Continued mining in Area E would contribute a small amount to the continuation of existing social impacts in the Colstrip-Forsyth area.

The Final EIS written on Areas A and E in 1977 (Montana Department of State Lands, 1977) stated that the expansion of the Area A and E portions of the Rosebud mine would not measurably affect the social structure of the Colstrip-Forsyth area. Similarly, continuation of mining in Area E would not result in additional impacts to the area's social structure, because the 58 mine employees and their families are already residents of the Colstrip-Forsyth vicinity. Area E would not cause further population growth in Rosebud County. Area E would not add a significant amount to air pollution or noise in Colstrip and thus would not contribute significantly to the social and health problems attendant to those impacts (see Air Quality).

TABLE II-9.--Comparison of existing and postmining vegetative habitat types associated with various wildlife species

Species	Existing Habitat[1] (acres)	Postmining Habitat[1] (acres)	Percent Total Area[2] (existing)	Percent Total Area[2] (postmining)
Mule Deer (Odocoileus hemionus)	249	288	55	65
Pronghorn Antelope (Antilocarpa americana)	289	366	65	80
Sharp-tailed Grouse (Pediocetes phasianellus)	329	404	75	90
Sage Grouse (Centrocercus urophasianus)	191	225	40	50
Hungarian Partridge (Perdix perdix)	348	433	75	95
Merriam's Turkey (Meleagris gallopava merriami)	19	29	5	5
Raptors[3]	21	33	5	5

[1]Existing and postmining habitat types associated with each species are shown in appendix G-1.

[2]Rounded to nearest 5 percent. Total exceeds 100 percent because of overlap in habitat use.

[3]Raptors commonly observed in the Colstrip area:

Harrier (Circus cyaneus)
Red-tailed hawk (Buteo jamaicensis)
Rough-legged hawk (Buteo lagopus)
Golden eagle (Aquila chrysaetos)
Prairie falcon (Falco mexicanus)

2. Description of the Existing Environment

a. Population

The Colstrip-Forsyth area has experienced relatively rapid population growth over the past decade due to increased mining and construction of generating units 1-4 at Colstrip. This population influx reversed a trend of population decline dating to the 1930's (fig. II-9).

Colstrip and Forsyth received over 80 percent of Rosebud County's new settlement from 1970 to 1976. Colstrip's population grew from 200 to 2,682, more than a ten-fold increase, while Forsyth grew from 1,873 to 2,661, a 42 percent increase. Rosebud County's population peaked at nearly 11,000 in 1973, the height of construction employment for generating units 1 and 2 (Meadowlark, 1978). Growth had stabilized by 1977, when the Final EIS on mining areas A and E was written. In 1980 the population began to increase again as workers arrive to construct Colstrip generating units 3 and 4.

About 180 people live in the Colstrip-Forsyth area as a result of the Area E mine. This represents 2 percent of the estimated 1979 population of Rosebud County. Of the 180, 58 are miners at Area E and the remainder are associated ancillary workers and the families of both groups.

b. Social structure

The social structure of the Forsyth-Colstrip area in 1970 was dominated by ranchers, farmers, Indians, and small town populace. The attitudes of many people in the area was shaped by a land ethic and esthetic values. The use of the land was fundamental to the culture and way of life of persons who lived in the Northern Great Plains, including many American Indians, whose religion and philosophy saw man as part of the natural environment and believed much of man's identity derived from interaction with the natural world.

Agriculture has long been the principal economic force in the area; the region's culture is firmly rooted in the American agricultural ideology. The persons who lived in the area were used to little congestion, a well-established sense of community, and a slow pace of life. In the 1970's construction workers, miners, ancillary workers, and their families were added to this social structure. The resulting alteration in the way of life and interaction systems of the predominately agricultural society constitute the greatest impacts to date on the local social environment.

The population growth from coal development in Rosebud County changed the way individuals related to one another. People become less oriented toward others and more oriented towards institutions--for example, people came to depend on law enforcement officals to control crime instead of the traditional informal help between residents. The process included a

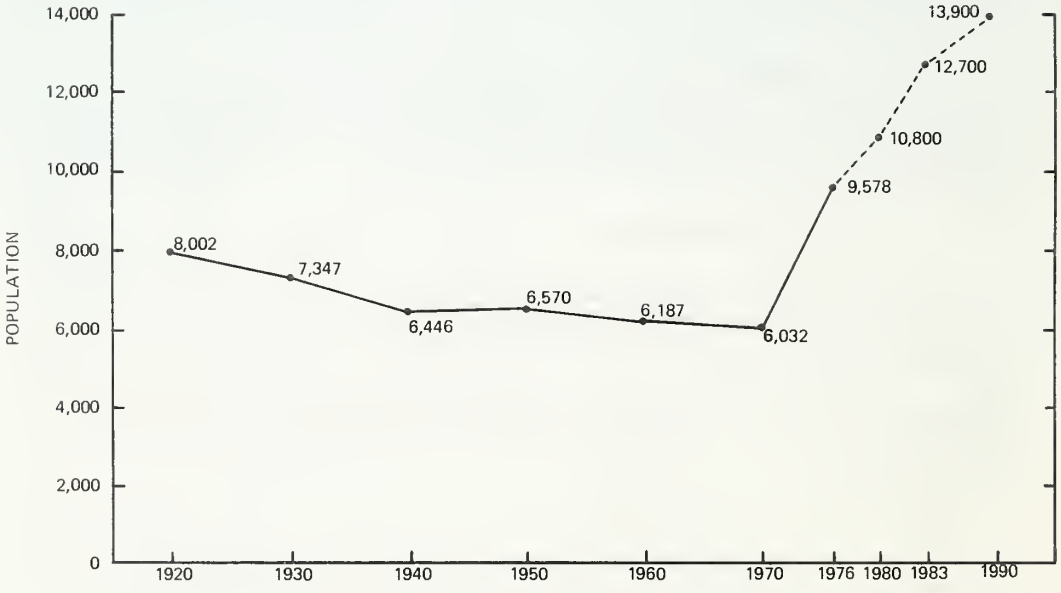

FIGURE II-9.--Rosebud County Population. Dashed line indicates projected population growth.

decline in local autonomy, exposure to different norms, and a fragmenting of the existing social order based on agriculture and building of a new one based more on urban-industrial values. Indicators of this change included less personal business transactions, greater emphasis on motorized recreation, and increasing rural subdivision.

c. Attitudes toward coal development

The differences of opinion between Colstrip-Forsyth residents and area ranchers concerning local coal development discussed in the previous EIS on Area E (Montana Department of State Lands, 1977) still exist. A study by Meadowlark (1978) found that the majority of Colstrip and Forsyth residents supported additional coal development; about one-third said the existing level of coal development was "about right". In contrast, the majority of ranchers interviewed felt that the existing amount of coal development was about right; nearly one-third stated it was too high.

The problems identified by the ranchers as being their greatest concerns are to some extent attributable to coal mining. For example, problems with litter, road maintenance, trespassing, power plant emissions, noise, and friction between neighbors--all mentioned as problems by the ranchers interviewed--have probably been exacerbated by coal-related population increases. The results of the attitude study are consistent with those reported in Gold and others (1974), which shows the value conflicts between the rural, agrarian lifestyle of the ranchers and the more urban, industrialized lifestyle of the mining and construction workers.

d. Noise

Noise from mining in Area E is far enough from Colstrip and isolated further in the mine pit to be negligible in Colstrip. Only occasional blasting is noticeable in town; because it is intermittent, it occurs only during daytime work hours, and its short duration makes annoyance unlikely (FES 79-29--U.S. Department of the Interior, 1979).

e. Mental health

Many residents of Colstrip feel a general malaise or uneasiness, apparently due to feeling bored or trapped in a place that they feel is not a suitable home (Eric Deeter, Director, Rural Health Initiative, oral commun., July 30, 1980). The U.S. Department of Housing and Urban Development (1976) identified other possible causes of this problem as a speeded pace of life, congestion and overcrowding, inflation in prices, fear of change for present residents, and lack of activities and belonging for newcomer families. Some Colstrip residents have cited the lack of family-oriented recreation (for example, bowling) as a cause of boredom (Keith Bennett, Bureau of Land Management, oral commun., July 31, 1980). This lack of opportunities for social activities could lead to problems in some individuals such as drug abuse, overeating, and excessive drinking.

Colstrip has a serious drug problem. Alcoholism among teenagers is bad because they come in contact with newcomers continually, have few employment opportunities, and too few recreational opportunities. Many young people have the access to and the money to buy alcohol and drugs. The proportion of young people in Colstrip is also high.

Colstrip residents face stressful situations such as changes in population size, changes in social status, and lack of permanance, all of which can cause mental health problems in some individuals, ranging from minor emotional stress to clinical mental illness. People who have lived in Colstrip about 4-6 years have been experiencing these problems more than recent newcomers or long-time residents (Eric Deeter, oral commun., July 30, 1980). According to Deeter, the rate of reported mental health problems in Colstrip is one-fourth to one-half larger than the rate in Forsyth or Miles City, but less severe than in some energy boom towns such as Rock Springs or Gillette. This is due to efforts by Montana Power Company (which owns Colstrip) and government agencies to provide adequate housing, schools, health facilities, human services, law enforcement, and some recreational amenities.

The relatively high wages earned by mine employees enables them to keep up with price inflation more easily than most long-time residents, those on fixed incomes, and others residents not employed in the mining industry. Feelings of relative economic deprivation may occur among those not sharing in the prosperity.

f. Trends

Cumulative effects from construction of generating units 3 and 4 and expansion of both the Rosebud and Big Sky mines will significantly affect the quality of life in the Colstrip-Forsyth area whether or not mining in Area E continues. Cumulative impacts of mining and power generation are discussed in volumes 1 and 3 of FES 80-1 (U.S. Department of the Interior and Montana Department of State Lands, 1980) and are summarized below.

Colstrip's population is expected to be 5,000 in March, 1981, peaking at 8,000 in 1983 at the height of construction, and stabilizing at 5,000 by 1985, assuming no new generating units or large mines are built after then (Pat Reardon, Sunlight Development Corp., oral commun., July 17, 1980).

Rosebud County's population is projected to reach nearly 14,000 by 1990, an increase of over 40 percent from 1979. Most of this projected growth would be due to the construction and operation of Colstrip units 3 and 4 and the projected expansion of the Rosebud mine needed to provide coal for the new generating units. During the years of most rapid growth, local government, formal and informal institutions, and social networks in Colstrip and Forsyth would not be able to meet the demands placed on them, according to FES 80-1.

The loss of more personal service and slow pace of life generally possible in small towns such as Forsyth and Colstrip would lead to continued dissatisfaction and stress among many individuals. According to Gold (1975), "[t]hese stresses and the dissatisfaction they cause may be translated into additional abusive behavior, mental illness, alcoholism, and crime, with consequent impacts on its victims."

The proportion of Colstrip residents experiencing alcohol, drug abuse, and mental health problems will likely increase as large numbers of workers arrive to build Colstrip generating units 3 and 4. Colstrip residents would continue to be exposed to levels of atmospheric particulate which exceed the Federal primary air quality standard established to protect human health. Resultant health problems are a possibility. Residents of Colstrip will also continue to be exposed to noise levels which exceed U.S. Environmental Protection Agency guidelines established to protect human health and welfare. According to the U.S. Department of the Interior (1979), noise levels in Colstrip from the existing generating units range from 59 to 68 dBA (L_{dn} values--night readings weighted), which exceed the 55 dBA level recommended by the EPA (cited in U.S. Department of the Interior, 1979) for the protection of public health and welfare.

Mine employees and their families would continue to benefit from employment with Western Energy. Area businessmen (mostly in Forsyth) would benefit from business generated by mine employees. There are few businesses in Colstrip.

Residents of Colstrip would continue to experience strained services and facilities (such as recreation) and the lack of some services (such as a hospital).

3. Impacts of the Proposal

See summary of impacts. The primary effect would be to continue Area E's relatively small contribution to the existing social impacts discussed above. This is essentially the same conclusion as was reached in the 1977 EIS on Area E.

4. Mitigating Measures

Western Energy could initiate a study of social groups in the Colstrip-Forsyth area such as family, church, government, volunteer groups, etc., which would allow more complete predictions of impacts. This, in turn, would allow local agencies to plan for those impacts and take measures to reduce their severity. The Department of State Lands does not have the authority to require such a study.

I. ECONOMICS

1. Summary of Impacts

Approval of the Area E extension would not have a significant adverse economic impact because the mine is an existing operation that provides a tax base for Rosebud County and the two Colstrip school districts.

2. Description of the Existing Environment

a. Employment and Income

Total employment in Rosebud County changed little between 1950 and 1970, averaging 2,100-2,200 jobs. The steady decline in agricultural employment was generally offset by a contemporaneous increase in public sector, trade, and service jobs.

The reopening of the Rosebud mine by Western Energy in 1968 began to change the structure of the economic base of Rosebud County. The base became increasingly dominated by jobs directly associated with the mining and conversion of coal (table II-10). Mining in Area E now provides about 58 jobs and has been an integral but minor part of this process. The construction of Colstrip generating units 3 and 4 will be the dominant force for employment change in the county for the next 4 years.

Unemployment rates in the county were substantially lower than the State figure during the construction of Colstrip units 1 and 2 from 1971 to 1975. During the 4-year period starting in 1976 (after construction was finished) unemployment in the county was much higher than during construction. In 1977 and again in 1979, the county's unemployment rate was higher than the State's rate.

Not all county residents benefited to the same degree from the increased employment opportunities during the first half of the decade. The unemployment rate on the Northern Cheyenne Indian Reservation, even during the height of construction, was much higher than in the surrounding area (table II-11).

Between 1950 and 1970 total personal income increased at a slower rate than the State's. By 1970 the county's per capita income figure had lost 9 points to the State, decreasing from 93 percent to 82 percent of the State average. Although there were some exceptional years associated with high construction income, the per capita income continued to grow at a generally slower rate after 1970. By 1977 per capita income in Rosebud County was $4,528--74 percent of the State average (see table II-12).

The slow growth of per capita income in the county during 1970-77 was generally the result of several bad years in the agricultural sector. Farm proprietors suffered, on average, net losses in 1975, 1976, and 1977 (table II-13).

TABLE II-10.--Employment by broad industry and sector in Rosebud County, 1972-1977

[Source: U.S. Department of Commerce, 1979]

	1972	1973	1974	1975	1976	1977
Agriculture[1]	682	668	681	623	591	547
Mining	104	269	283	392	416	403
Manufacturing	265	192	180	160	146	52
Federal government	173	174	204	226	221	222
Construction (part)[2]	0	0	0	1,058	400	115
TCU[3] (part)[4]	25	12	11	0	0	7
Total economic base	1,249	1,315	1,359	2,459	1,774	1,346
Trade	269	312	346	411	425	367
FIRE[5]	37	43	49	50	61	61
Services[6]	798	845	916	1,221	1,249	1,235
Construction (remain)	39	76	180	296	259	230
TCU[3]	167	181	201	210	226	231
Local and State government	367	402	466	549	559	574
Total ancillary	1,677	1,859	2,158	2,737	2,779	2,698
Total employment	2,926	3,174	3,517	5,196	4,553	4,044

[1]Farm proprietors plus farm wage and salary.
[2]Proportion greater than .0569 of total employment.
[3]Transportation, communications, and utilities.
[4]Proportion greater than .0571 of total employment.
[5]Finance, insurance, and real estate.
[6]Includes: other industry wage and salary and nonfarm proprietors.

TABLE II-11.--Unemployment rates, 1970-1979 (percent)

[Sources: Montana Department of Labor and Industry, 1980; U.S. Department of the Interior, 1970-1980]

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Rosebud Co.	3.1	3.0	3.2	3.2	3.6	3.3	5.8	6.9	5.9	5.2
N. Cheyenne Indian Res.*	NA	36.0	27.0	25.0	NA	40.0	43.0	37.0	45.0	34.0
Montana	4.3	4.8	4.8	4.8	5.2	6.4	6.1	6.4	6.0	5.1

*Unemployment rate is defined slightly differently and tends to overestimate unemployment relative to the other method.

TABLE II-12.--Per capita personal income, selected years 1950-77 (current dollars)

[Source: U.S. Department of Commerce, 1979]

	1950	1959	1970	1972	1973	1974	1975	1976	1977
Rosebud Co	$1,510	$2,077	$2,768	$3,224	$4,503	$4,180	$5,409	$4,992	$4,528
Montana	1,622	2,010	3,395	4,013	4,760	4,976	5,381	5,648	6,093
Rosebud/ Montana	0.93	1.03	0.82	0.80	0.95	0.84	1.01	0.88	0.74

The most recent personal income figures reflect the county's increasing dependence on coal-related employment. In 1977 nearly one-fourth of the personal income in Rosebud County directly resulted from mining. Much of the construction and transportation sector wages were also a result of coal development.

b. External costs

Coal development in the Colstrip area has had effects which are not reflected in the mining firms' costs. These "external costs" are difficult to measure, but if they could be measured they might be higher than known costs such as for facilities and services (Old West Regional Commission, 1979). External costs of coal mining (of which Area E contributes a small part) include:

- The option value of the coal mined, which is the value of retaining the coal for future use instead of consuming it now.
- Human health effects resulting from increases in air, water, and solid waste pollution.
- Objective changes which have socioeconomic effects, such as increased congestion costs in public facilities and services and increased incidence of personal injury and property damage crime resulting from growth; adverse economic effects during the post-development period; mental health effects of environmental degradation and increased stress; localized inflation in the cost of living, particularly in housing costs; and increases in travel time, accident rates, and recreation costs due to congestion associated with growth.
- Subjective changes which have socioeconomic effects, such as a deleterious alteration of the perceived quality of life caused by industrial intrusion, community expansion and change, and changes in the work and social environment.

TABLE II-13.--Personal income in Rosebud County by major sources, 1972-77 (thousands of dollars)

[Source: U.S. Department of Commerce, Regional Economics Information System, Bureau of Economic Analysis, Unpublished Table, April, 1979]

Item	1972[1]	1973[1]	1974[1]	1975[2]	1976[2]	1977[2]
Total labor and proprietors income by place of work[3]						
By type						
Wage and salary disbursements	12,556	17,079	21,911	50,598	41,457	36,572
Other labor income	882	1,448	1,854	4,050	4,030	3,958
Proprietors income[4]	3,943	8,529	4,357	1,953	1,683	2,018
Farm	2,165	6,520	2,397	-158	-506	-589
Non-farm[4]	1,778	2,009	1,960	2,111	2,189	2,607
By industry						
Farm	3,727	8,326	4,568	1,814	1,215	949
Non-farm	13,654	18,730	23,554	54,787	45,955	41,599
Private	10,405	15,031	19,057	49,005	40,066	34,747
Ag. serv., for., fish., and other[5]	146	119	128	152	333	211
Mining	1,285	4,279	4,914	8,291	10,237	10,575
Construction	534	1,020	3,389	26,952	14,794	8,969
Manufacturing	1,347	1,117	1,239	1,198	938	595
Non-durable goods	908	676	689	681	677	237
Durable goods	439	441	550	517	261	358
Transportation and public utilities	2,171	2,489	2,882	3,030	3,593	4,064
Wholesale trade	218	256	294	454	482	472
Retail trade	1,488	1,877	2,002	2,555	2,659	2,546
Finance, insurance, and real estate	275	312	375	404	585	638
Services	2,941	3,562	3,834	5,969	6,445	6,677
Government and government enterprises	3,249	3,699	4,497	,782	5,889	6,852
Federal, civilian	1,240	1,365	1,638	2,047	1,746	2,267
Federal, military	81	90	110	139	143	155
State and local	1,928	2,244	2,749	,596	4,000	4,430
Total labor and proprietors income by place of work	17,381	27,056	28,122	56,601	47,170	42,548
Less: personal contributions for social insurance by place of work	721	1,066	1,371	3,127	2,505	2,139
Net labor and proprietors income by place of work	16,600	25,990	26,751	53,474	44,665	40,409
Plus: residence adjustment	-1,020	-1,466	-1,912	-10,841	-6,441	-4,976
Net labor and proprietors income by place of residence	15,640	24,524	24,839	42,633	38,224	35,433
Plus: dividends, interest, and rent[6]	2,508	3,338	4,309	5,149	5,877	6,623
Plus: transfer payments	2,546	3,013	3,565	4,426	5,246	5,500
Personal income by place of residence	20,694	30,875	32,713	52,208	49,347	47,556
Per Capita Personal Income (Dollars)	3,224	4,503	4,180	5,409	4,992	4,528

[1]Estimates based on 1967 SIC.
[2]Estimates based on 1972 SIC.
[3]Consists of wage and salary disbursement, other labor income, and proprietors, income. Primary source for private non-farm wages: ES-202 covered wages--Montana Employment Security Commission.
[4]Includes the capital consumption adjustment for non-farm proprietors.
[5]Includes wage and salaries of U.S. residents working for international organizations.
[6]Includes the capital consumption adjustment for rental income of persons.

- Esthetic losses and increased noise.

- Social impacts due to the physical, social and political changes in the affected communities.

- Loss of archaeological and/or historical sites.

Some of these costs are borne by future generations as well as by people living near the active mine. The traditional means of including external costs in private costs is through taxation (Old West Regional Commission, 1979). Because of the difficulty in measuring external costs it is not known how well tax revenues satisfy external costs.

c. Fiscal conditions

Recent coal development in Rosebud County has had a major effect on the fiscal structure of Rosebud County. The taxable value associated with the gross proceeds of the Western Energy and Peabody mines and the Colstrip generating units has become the major source of the county's taxable value. In 1970 the two categories represented less than one-fifth of the taxable value; by 1978, they exceeded three-fourths. This rapid growth in taxable value--nearly sevenfold between 1970 and 1978--is largely responsible for the decline in the county's tax rate, which fell from 54.55 mills in fiscal year 1971 to 26.632 mills in fiscal 1979. The 1979 rate for Rosebud County was very low compared to the State average of 44.8 mills.

The coal production in Area E has been a small but integral part of the fiscal effects of coal development in Rosebud County. In fiscal 1979, coal production from Area E represented perhaps 5 percent of the county's taxable value. Most of the growth in taxable value has come from the generating units (41 percent of the growth), an 18-fold increase in coal production accompanied by a tax law change (26 percent), and substantial increases in both the amount of oil and the wellhead price of oil produced in the county (21 percent).

The growth in taxable value has occurred primarily near Colstrip and therefore has also benefited the Colstrip school districts: in 1979, the mill levy for High School and Elementary Districts 19 was 62 mills, compared to an average 122 mills statewide.

Coal development has not helped all taxing jurisdictions in Rosebud County. The total mill levy in Forsyth (the school, city, and county levies) has remained relatively constant, because the additional revenues needed to accommodate coal-induced growth has largely offset the reduction in the county's tax rate. The total levy in Forsyth has remained near the statewide average.

Additional information on fiscal conditions in Rosebud County is found in chapter 7 of the Rosebud County Planning Data Book (Rosebud County Planning Board, 1979).

Since 1975, three sources of revenue based on the contract sales price of coal have been available in Montana: the resource indemnity trust tax, the gross proceeds tax, and the coal severance tax. The taxes are based on the contract sales price, which is defined as the f.o.b. mine price less property, severance, and resource indemnity trust taxes charged to the seller.

The resource indemnity trust tax is an annual tax of $25 plus 0.5 percent of the contract sales price revenue in excess of $5,000 that is received from the sale of all minerals, including coal, extracted from the State. Income from the interest raised by the trust account based on this tax was available to and used by the State for the first time in fiscal year 1980. The gross-proceeds tax is an ad valorem property tax. Each taxing jurisdiction applies its mill levy against the taxable value of the coal, i.e., 45 percent of the contract sales price.

The coal severance tax is 30 percent of the contract sales price and is collected by the State for use as shown in Appendix I-1. The dedication of a portion of the mineral taxes to permanent trust funds provides a long term flow of revenue that will benefit not only current State residents but also partially compensate future generations for the loss of a nonrenewable resource. Taxes now collected from Area E are shown in table II-14. In 1979 the severance tax was responsible for about $2.59 of the average Montana Power residential customer's annual cost of $234.80. The tax represented about 1.1 percent of the total annual bill, which equals the highest percentage paid by the residential customers of all other utilities which bought Montana coal in 1979 (Appendix I-2).

3. Impacts of the Proposal

The employment in Area E would continue to provide a small and decreasing portion of total personal income in Rosebud County--somewhat less than the 3.5 percent the mine contributed in 1977. For the next 4 years, the construction of generating units 3 and 4 will dominate the income picture in Rosebud County. Mining at Area E will end in 1984; projected (but not yet permitted) mining at Area D would continue the existing employment at Area E for at least 2 decades.

Over the next 4 years, Area E would contribute a declining proportion of the taxable value in Rosebud County and School Districts 19, primarily because of the addition of Colstrip generating units 3 and 4 to the tax base and the projected increases in total coal production over the next 4 years. If the price of Area E coal continues to go up at a slower rate than other Western Energy coal (between 1975 and 1979 the contract sales price of all Western Energy coal went up by 33.6 percent, while coal from Area E increased by 28.3 percent), this would also tend to reduce the mine's relative contribution.

Area E would continue to be responsible for a small and declining share of the total external costs of coal development in the Colstrip area (see section 2, Description of the Existing Environment).

TABLE II-14.--Public revenues generated by Area E, 1980-84

[Thousands of constant 1979 dollars. Source: Appendix I-2.]

Year	Production (thousands of tons)	Prices		Federal revenues			State revenues		Local government revenues
		f.o.b.[1]	C.S.P.[2]	Royalties[3]	Abandoned Mine Reclamation[4]	Black Lung[5]	Severance Tax[6]	R.E.I.T.[7]	Gross Proceeds[8]
1980	5,436	$5.740	$3.910	$1,509.9	$1,902.6	$624.0	$6,376.0	$106.3	$ 908.6
1981	1,627	7.380	5.108	2,521.5	569.5	240.1	2,493.2	41.6	355.3
1982	3,164	7.235	5.003	4,566.2	1,107.4	457.8	4,748.2	79.1	676.6
1983	3,295	7.270	5.028	4,840.6	1,153.3	479.1	4,970.1	82.8	708.2
1984	3,069	7.130	4.925	4,149.0	1,074.2	437.6	4,534.7	75.6	646.2
Total	16,591			17,587.2	5,807.0	2,238.6	23,122.2	385.4	3,294.9

[1] f.o.b. = freight on board, gross market value of each ton of coal, a weighted average taking differential royalties into account.

[2] C.S.P. = Contract Sales Price, the f.o.b. price less production taxes, a weighted average taking differential royalties into account.

CSP = FOB - 0.35 - (0.02)FOB - (0.3)CSP - (0.005)CSP - (0.043)CSP or FOB = 1.35CSP + $0.46

[3] Coal produced from lease Billings 020989-038770 has a royalty rate of $0.15 per ton. Coal produced out of lease M-035735 is at 21 percent of the f.o.b. price ($1.55 per ton). Table II-16 summarizes production by lease.

[4] $0.35 per ton.

[5] 2 percent of the f.o.b. price.

[6] 30 percent of the C.S.P.

[7] R.E.I.T. = Resource Indemnity Trust tax, 0.5 percent of the C.S.P.

[8] Assumes a tax rate of 95 mills. Applied to a taxable value of 45 percent of the C.S.P.

Tax revenues would increase because of an increase in Federal royalties. Federal royalties are a component of the contract sales price (CSP) which is the basis for the Montana coal severance tax and local production taxes. In 1980, the Federal royalty rate on a portion of the coal produced from Area E (table II-15) will go up to 21 percent of the f.o.b. price from the current flat rate of 15 cents/ton; State and local production taxes that use the CSP as a base will increase proportionately (Appendix I-3). The increase in the CSP will cause the Montana severance tax to increase to $1.53/ton of Area E coal. If passed on to the consumer, these tax increases would increase the average annual Montana Power Company residential utility bill by about $.60 in 1980, $4.40 in 1981, and slightly less than $4.40 from 1982 through 1984 (Appendix I-3).

TABLE II-15.--Area E coal production by lease, 1980-84

[Data are in thousands of tons. Source: Sherry Schwend, Western Energy Company, written commun., September 9, 1980.]

Year	Total Production	Federal Lease Billings 020989-039770	Federal Lease M-035735	Burlington Northern Lease
1980	5,436*	2,389	743	2,304
1981	1,627**	-----	1,627	-----
1982	3,164	241	2,923	-----
1983	3,295	190	3,105	-----
1984	3,069	125	2,665	279
Total	16,591	2,945	11,063	2,583

*2,227,000 tons would be hauled to the Area A & B facilities to meet contracts of Area B.

**1,600,000 tons would be hauled from Area B to Area E to meet contracts of Area E.

J. COMMUNITY SERVICES

1. Summary of Impacts

Continued mining in Area E would not increase the need for community services in Rosebud County. Services and facilities provided in response to construction of Colstrip generating units 1 and 2 are generally adequate for the population attributable to Area E; construction of generating units 3 and 4 has required substantial expansion of most services and facilities.

2. Description of the Existing Environment

Much of the information in the following discussion is from the Planning Data Book and Comprehensive Plan (Rosebud County Planning Board, 1979), which contains extensive additional information on community services in Rosebud County.

a. Housing

The final EIS on Areas A and E (Montana Department of State Lands, 1977) stated that housing demand had eased following the construction of generating units 1 and 2. Housing is once again in short supply because of the large increase in population accompanying construction of units 3 and 4. Sunlight Development Corp., a Montana Power Company subsidiary which provides most of the housing in Colstrip, did not have funding to construct housing until November, 1979, when units 3 and 4 were authorized. One of the most serious problems in developing new housing in Rosebud County is the lack of good information concerning groundwater availability for domestic use (Eldon Rice, Rosebud County Planner, oral commun., April 18, 1980). The quality of existing housing also needs to be improved: about 80 percent of the single family residences in the county are below the State average, according to the Montana Department of Revenue grading system.

b. Water system

Much work has been done on area water systems since the final EIS on Areas A and E was prepared. Colstrip, Forsyth, and Ashland each have an adequate water supply at present. Lame Deer will need to expand the existing system as the population increases. Some Area E miners live in Lame Deer, but as with Colstrip and Forsyth, their numbers are not expected to increase.

c. Waste disposal

Rosebud County is now a member of the Tri-County Solid Waste Program. The landfill dumps in Forsyth and Ashland were closed and replaced with garbage canisters which are emptied and the garbage compacted and hauled to a landfill near Billings. Colstrip continues to use an old mining pit for its dump. Lame Deer still uses its landfill dump.

Colstrip, Ashland, Forsyth, and Lame Deer now have adequate sewer capacity.

d. Police protection

As described in the 1977 EIS, law enforcement is provided by the County Sheriff's Office for all of Rosebud County excluding the Northern Cheyenne Indian Reservation. One sheriff, an undersheriff, and 12 deputies patrol this area with 10 cars. According to the former U.S. Bureau of Reclamation (U.S. Department of the Interior, 1977), the number of patrol cars is adequate but the number of personnel is barely adequate.

e. Fire protection

There has been little change in the volunteer fire departments that serve Colstrip, Ashland, Forsyth and Lame Deer since the previous EIS was written. The insurance rating for Forsyth has improved from Class 7 to Class 5 because the city rebuilt the municipal water system. Most of the Rosebud County's rural residents lack a rural fire district to provide fire protection.

f. Library

The Sagebrush Bookmobile Service now covers all of Rosebud County, stopping at Forsyth, Lame Deer, Colstrip, and Ashland. The Forsyth Library (20,000 volumes) is still the only one in the county. It is adequate for the county's population, according to the guidelines of the Public Library Association (1962).

g. Communication

One local radio station continues to serve Rosebud County. Six T.V. channels can be received in Forsyth via cable. The weekly Forsyth Independent and daily Billings Gazette provide news to area residents.

h. Welfare services

Welfare services in Rosebud County are provided by the Montana Department of Social and Rehabilitation Services. Rosebud County appears to be adequately staffed with 3 social workers and one public health nurse, who work out of full-time offices in Forsyth and Lame Deer (FES 80-1--U.S. Department of the Interior and Montana Department of State Lands, 1980). Services for the aged are provided in a new center in Forsyth and a small center in Ashland.

i. Schools

New elementary schools have been build in Colstrip and Forsyth, a new middle school in Forsyth, additional classrooms and a gymnasium in Ashland, and a high school in Colstrip. Schools in Colstrip and Forsyth should be able to handle the additional pupils that will arrive

with the construction of units 3 and 4. The Dull Knife Memorial College on the Northern Cheyenne Indian Reservation is expanding its facilities.

j. Health facilities

Colstrip now has a medical and dental clinic and a 24-hour ambulance service. Forsyth's hospital is critically understaffed with physicians, especially specialists; many Rosebud County residents travel to Miles City and Billings for specialized care. This is a common situation in rural Montana counties. Forsyth's emergency medical service (which also includes a 24-hour ambulance) has been greatly improved with new equipment and training programs. Forsyth also has a dentist and part-time optometrist. A counseling psychologist provides services to residents of Forsyth, Colstrip, Ashland, and the Northern Cheyenne Reservation.

Even though a full-time psychologist will begin working in Colstrip in September, the mental health service is understaffed (Jim Peterson, Assistant Director, Eastern Montana Region 1 Community Mental Health Service, oral commun., August 5, 1980). There is no longer a social worker in Ashland, and a mental health nurse no longer makes calls in Rosebud County.

3. Impacts of the Proposal

The final EIS on Areas A and E (Montana Department of State Lands, 1977) anticipated no social service impacts from the extension of ongoing mining into Areas A and E. That prediction has been borne out, largely because improvements made in response to the population influx accompanying construction of generating units 1 and 2 were generally adequate for the smaller population that remained once the units were completed. Similarly, the impacts on community services caused by continued mining in Area E would not be measurable. The population attributable to Area E would continue to contribute a only small amount to the need for facilities and services. The community services required to serve the population influx accompanying the construction of generating units 3 and 4 would vastly outweigh the demands generated by the 180 people attributable to Area E operations. Health care and recreation facilities will continue to be the most-stressed community services.

Due to delays in the construction of generating units 3 and 4, the greatest strain on services will occur about 1983 instead of 1980 as stated in the final EIS on Areas A and E. This delay provided additional time to expand local services (especially health services) in preparation for the population influx accompanying construction.

K. LAND USE

1. Summary of Impacts

The Area E extension would not signficantly affect land use in Rosebud County, because mining the 410 acres of rangeland would temporarily reduce available grazing land in Rosebud County by only 0.02 percent. If managed properly by the landowner or grazing lessee, the reclaimed mine area would be about as productive as it was in 1975, the last year it was grazed.

2. Description of the Existing Environment

The land use pattern and the productivity of the land on the 450 acres of the proposed Area E extension is similar to that found in the rest of the Western Energy leasehold, Rosebud County, and southeastern Montana. All but about 28 acres of the 450 acres (94 percent) were being used for rangeland when Area E opened (table II-16). In comparison, rangeland uses make up 67 percent of the Western Energy leasehold, 78 percent of Rosebud County, and 74 percent of the 45-million-acre Yellowstone River subbasin (Rosebud County Planning Board, 1979). In 1975, rangeland in the Area E extension had a productivity of about 0.26 animal unit months (AUMs)/ acre, or 62 percent of its potential 0.42 AUMs/acre. Because it has not been grazed since 1975, its current productivity is probably somewhat higher than 0.26 AUMs/acre, but still within normal for southeastern Montana--0.25 to 0.30 AUMs per acre. Under optimum management, the rangeland of the Area E extension has the potential to support about 18.9 cow-calf units for a 10-month grazing period, based on the potential stocking rate of .42 AUMs/acre. That stocking rate would generally produce about 9,400 pounds of yearlings/year.

Mining in Area E before 1968 disturbed about 260 acres, all of which have been regraded and revegetated. Since 1968, about 950 additional acres have been disturbed. About three-fourths of of the 950 acres are being reclaimed (see table II-16). Because modern reclamation in the northern Great Plains has been undertaken only in the last 5 years, the potential long term productivity of Area E is not known. Section 3 (impacts) discusses probable short-term vegetative productivity on the reclaimed portions of Area E based on current reclamation experience.

The cumulative land use impacts of recent coal development in Rosebud County have been principally confined to the Colstrip and Forsyth vicinities and the transportation corridor between the two towns. About 3,550 acres of agricultural land have been temporarily displaced by mining (3,350 acres of rangeland and 200 acres of cropland). Although lands now being mined must be reclaimed, projected new mining will probably increase the total amount of land out of range production at any one time. About an additional 550 acres in Colstrip and Forsyth have been permanently devoted to urban and industrial uses during the same time (Montana Department of State Lands, 1980). The cumulative impacts of coal mining to date represent 0.1 percent of Rosebud County's 2.5 million acres of range and pasture land and 0.2 percent of the nearly 130,000 acres of crop land.

TABLE II-16.--Western Energy land use summary

	Premining			Current Conditions			Expected Condition 1/1/85		
	Rosebud Mine	Total Area E	Area E Extension	Rosebud Mine	Total Area E	Area E Extension	Rosebud Mine	Total Area E	Area E Extension
Undisturbed									
Crops	1,420	0	0	1,220	0	0	1,000	0	0
Ponderosa pine	7,440	28	28	7,290	28	28	6,900	28	18
Rangeland	16,500	1,845	422	14,683	898	422	16,143	672	12
Subtotal	25,360	1,873	450	23,193	926	450	24,043	700	30
Disturbed									
Active mining, spoils, and highwall reduction	640	260	0	315	161	0	300	0	185
Facilities & haul roads	0	0	0	395	40	0	300	40	10
Associated disturbance	0	0	0	29	20	0	100	20	0
Reclamation	0	0	0	2,011	986	0	1,200	1,373	225
Subtotal	640	260	0	2,750	1,207	0	1,900	1,433	420
Bond Release									
Crops	0	0	0	0	0	0	0	0	0
Ponderosa Pine	0	0	0	0	0	0	0	0	0
Rangeland	0	0	0	0	0	0	0	0	0
County Road	0	0	0	57	0	0	57	0	0
Subtotal	0	0	0	57	0	0	57	0	0
Total	26,000	2,133	450	26,000	2,133	450	26,000	2,133	450

Note: there are about 440 acres of unreclaimed spoils remaining from the original Northern Pacific mine. There are 380 acres in Western Energy's Area D designated Abandoned Mine Land by the U.S Department of Agriculture Soil Conservation Service and 60 remaining acres of Burlington Northern spoils along the railroad right-of-way. The 260 acres in Area E have been regraded and revegetated by Western Energy and Montana Power Company.

3. Impacts of the Proposal

Given adequate management, the postmining vegetative productivity of the reclaimed surface would not be measurably lower than the normal premining productivity. For the short term (5 to 7 years after reclamation begins), vegetative productivity on the better sites may increase sharply above premining levels, due to fertilization and to the release of nutrients following disturbance of the soil. As the released nutrients are taken up in vegetation, an equally rapid decline will probably follow. A gradual increase in productivity would probably then occur as nutrients are returned to the soil (FES 80-1, Volume 1, Chapter 4, Soils and Vegetation). Actual postmining productivity under normal management will probably be equal to or greater than levels actually achieved before mining. Further discussion is found in the Soils and Vegetation sections.

Mining and initial reclamation would preclude normal livestock grazing practices on about 225 acres of Area E until 1985 (table II-16); the remaining reclamation would further preclude normal ranching operations until bond release (a minimum of 10 years), although some grazing to demonstrate reclamation success would take place (see table II-16). During this next 5-year period, the entire Western Energy Rosebud mine, the Big Sky mine, and Colstrip generating units 1-4 would displace livestock grazing on about 5,900 acres--less than 0.2 percent of the available grazing land in Rosebud County. Although almost all of the displacement would be temporary, the construction and operation of Colstrip units 3 and 4 would result in about 890 acres being permanently devoted to urban and industrial uses, mostly in Colstrip but perhaps as many as 40 acres in Forsyth, where some of the workers would live (Montana Department of State Lands, 1980). Area E would not measurably contribute to this additional urban and industrial land use because the number of workers at Area E would not increase over the remaining 5 years of the mine.

L. TRANSPORTATION

1. Summary of Impacts

The Area E extension would not contribute significantly to the existing highway safety problems and occasional traffic delays from coal trains in the Colstrip-Forsyth area. Improvements to FAP 39 projected to be completed by 1982 should greatly alleviate both problems.

2. Description of the Existing Environment

a. Roads

Almost all people in the sparsely-populated Colstrip area travel by road. The road network, although not well developed, was generally adequate for the pre-development population. The main highway linking Colstrip with Forsyth and Lame Deer has been heavily used when mines and generating units were under construction.

Graveled county roads and two-lane State highways (fig. II-10) service the Colstrip area. Federal Aid Primary (FAP) 39 connects Colstrip with Interstate 94, the major east-west highway, to the north, and with FAP 37 (U.S. 212), a heavily used east-west highway, to the south. FAP 39 currently has 4 railroad crossings. It was designed and constructed about 30 years ago to serve as a secondary road servicing the agricultural community in the area. The highway has deteriorated over the years and is not suitable to convey the volumes of traffic caused by coal development.

The Montana Department of Highways is in the process of reconstructing 31 miles of FAP 39. A 7-mile section south of the intersection with I-94 has been completed. A contract for a 5.8-mile section was let in August of 1980. The contracts for the remaining sections are currently scheduled to be let in August and December of 1981. Assuming availability of funds and cooperative weather, the entire project could be completed by late 1983. The reconstruction consists of widening the roadway, resurfacing, realignment where needed, and railroad structures to provide grade separations at the places where FAP 39 and the Colstrip railroad spur intersect between I-94 and Colstrip.

FAP 37, which intersects FAP 39 at Lame Deer, leads west to Busby, Crow Agency, and Hardin and east to Broadus (fig. II-10). Heavily used by trucks, this two lane road presents dangerous driving conditions. The Department of Highways is currently planning to let contracts to reconstruct 27 miles of FAP 37 between Crow Agency and Busby in June and December 1981 and June 1982. Assuming that the contracts are let on schedule and the needed funds are available, these projects could be completed by late 1983.

Traffic on the major highways leading to Colstrip has increased considerably since mining resumed at Colstrip (table II-17). Traffic on FAP 37 increased about 60 percent from 1968 to 1978. Traffic on FAP 39 from Colstrip to Interstate I-94 increased about 220 percent from 1968 to 1978. This increase, combined with the current poor condition of the highway, the severity of the accidents that have occurred, and the four railroad crossings, has resulted in the Montana Department of Highways rating FAP 39 extremely unsafe--1 on a scale of 20 (Montana Department of Highways, 1978). The reconstruction projects scheduled for the road should make the highway as technically safe as any other two-lane highway in the State, although the driving habits of persons using the road would continue to play a major role in the road's accident rate.

During 1980, 1,321,700 tons of were hauled from Area E across FAP 39 to the Area A and B loadout facilities to help met the existing contracted requirements of Area B. Until a permit for Area E is issued, a reverse flow from the newly permitted portion of Area B would be needed to help meet contract requirements of Area E. Moving coal from Area B to Area E would require about 9.5 crossings/daylight hour on a yearly average basis. Because coal traffic is stopped when there is traffic on FAP 39, delays have not occurred and none are expected. Human error could cause a serious accident, although the potential for this is low.

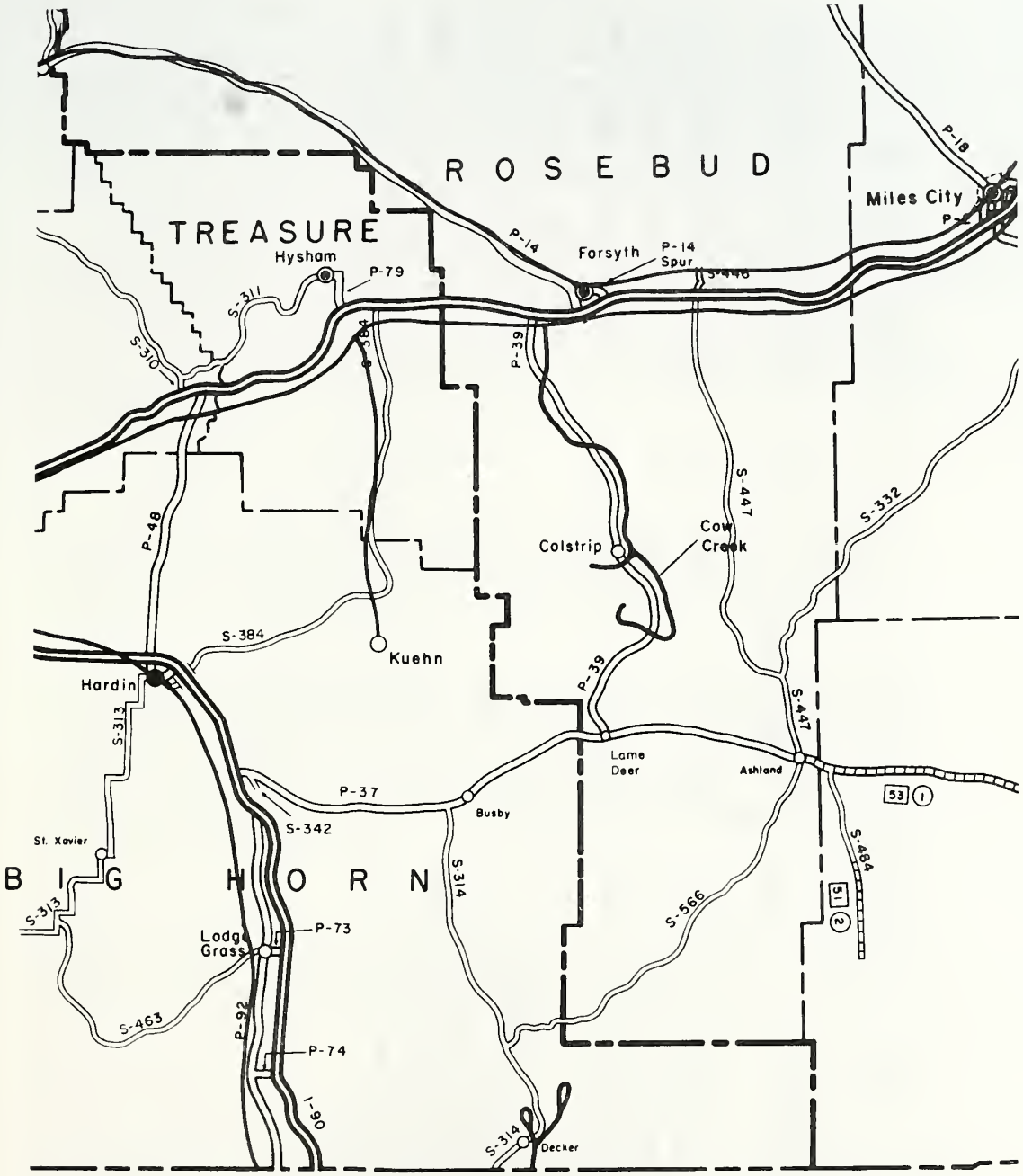

FIGURE II-10.--Transportation routes near Colstrip.

TABLE II-17.--Average daily traffic counts for highways near Area E, 1968-1978

[Source: Bob Keck, Montana Department of Highways, written commun., October 1979]

Highway segment	Year										
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
FAP 37											
Jct. 342 to Busby.....	673	603	657	701	766	860	778	791	1,052	1,443	1,159
Busby to Rosebud County line.....	782	773	802	766	854	924	914	1,072	1,223	1,585	1,153
Rosebud County line to Lame Deer.....	858	850	863	820	962	1,033	1,011	1,263	1,243	1,800	1,370
FAP 39											
Lame Deer to Reservation boundary.....	238	274	320	363	395	---	---	---	359	511	585
Reservation boundary to Colstrip.....	159	170	195	203	269	508	451	498	388	344	364
Colstrip to I-94 interchange.....	210	190	236	253	370	1,193	1,047	1,425	1,087	783	678

b. Railroads

A railroad spur connects Colstrip to the mainline of the Burlington Northern (BN) about 25 miles to the north near Nichols (fig. II-10). The spur serves both the Western Energy's Rosebud mine and Peabody's Big Sky mine 7.5 miles south of Colstrip. Although most of the coal from the Rosebud mine is shipped out of state--mainly to Minnesota and Wisconsin--only about 20 percent of the production from Area E leaves Colstrip.

Montana Power's Corette plant in Billings receives about 680,000 tons of coal/year from Area E. An average of 37 loaded unit trains/week used the Colstrip spur during 1979. This amounts to 74 trips/week counting returning empty trains. The trains used to ship coal to Billings have 60 cars instead of the average 100 cars, so Area E contributed about 6 percent of the total coal train traffic. On rare occasions the Colstrip spur is used to haul heavy machinery for construction projects; otherwise, only coal is hauled on the spur.

3. Impacts of the Proposal

Impacts on transportation from the Area E extension would not be significant: road traffic associated with the mine would not exceed projected highway capacity; rail capacity would not be affected because coal production at Area E would not be increased and only about 20 percent of the Area E production is shipped out of Colstrip.

By 1983 the average daily traffic on FAP 37 between Colstrip and I-94 will be about 1,300 vehicles/day, an increase of more than 80 percent over the 1978 figure. The road's capacity could be exceeded until the improvements scheduled by the Montana Department of Highways are completed. The increased traffic will be almost entirely due to the construction of Colstrip generating units 3 and 4. The Area E extension would not contribute to the increase, but does represent perhaps as much as 3 percent of the current daily traffic.

During the 1980's, rail traffic on the Colstrip spur would more than double. This would not exceed the spur's capacity. Area E's relative contribution would decline from its current 6 percent level as total traffic increased and Area E traffic remained constant.

M. RECREATION

1. Summary of Impacts

Continued mining at Area E would not significantly increase demands on developed recreation facilities or undeveloped recreation areas. The minesite itself is not a significant recreation resource.

2. Description of the Existing Environment

a. Urban recreation resources

Outdoor recreation facilities in Forsyth include baseball fields, tennis courts, several parks, a swimming pool, a golf course, and ice-skating rinks. Indoor facilities include a bowling alley, two movie theaters, three gymnasiums, and a museum. The facilities are generally well-used. Forsyth residents are seeking funds for a new swimming pool because the existing pool does not meet State health standards. They also plan to add to the picnic and playground facilities and volleyball and basketball areas.

Colstrip's outdoor recreation facilities also include baseball fields, tennis courts, several parks and playgrounds, and a swimming pool. Indoor facilities include saunas, a weight room, a handball court, a racquetball court, and a gymnasium. The outdoor facilities are generally well-used; demand for the handball and racquetball courts is expected to exceed capacity soon. The gymnasium was designed for a population of 2,300 and is unable to accommodate the expanding population of Colstrip, estimated at 3,300 in July, 1980. The Colstrip Area Recreation and Parks Association plans to build a structure over the pool to make it useable year-round. A multipurpose room in the community center will be used for youth activities.

b. Non-urban recreation resources

Developed outdoor recreation facilities in Rosebud County include a motocross course and rodeo grounds; the Rosebud State Park near Forsyth (picnic sites, fishing, and boating); the Surge Pond Recreation Area near Colstrip (nonmotorized boating, picnic sites, and play fields), and various campgrounds and several rockhounding areas.

Undeveloped outdoor recreation resources in Rosebud County include the Yellowstone and Tongue Rivers, which are used for fishing, boating, and bird watching; about 233,000 acres of public land managed by the U.S. Bureau of Land Management; and about 100,000 acres of the Ashland Division of the Custer National Forest. Some private lands are open to public use, typically hunting and fishing. The influx of people associated with coal development has resulted in greater restrictions on access to private lands than any other part of region 8 of the Montana Department of Fish, Wildlife, and Parks, according to that agency (Neil Martin, oral commun., August 28, 1980).

The major recreation values of the public lands in the county are isolation, diverse topography, scenery, and big game. Neither the Ashland Division nor the B.L.M. lands offer many water-based recreational opportunities. Recreational use of these undeveloped lands continues to be low. Hunting is the primary use, but there are also opportunities for hiking, horseback riding, picnicking, photography, rock climbing, and similar uses.

Outdoor recreation use is not approaching capacity in the Colstrip area. The only recreational use projections for the Colstrip area are for the Ashland Division (U.S. Department of Agriculture, 1979). Without further energy development, recreational use of the Ashland Division will probably increase 5-10 percent in the next decade. Extensive development of coal (independent from Western Energy) could significantly alter recreational use--from approximately 37,800 recreation visitor days (RVDs) in 1975 to about 70,000 RVDs in 1985. Most of the increase would be from local users.

Recreation surveys conducted in the summer of 1976 and winter of 1977 by the Department of Fish, Wildlife, and Parks found that most residents of the area preferred recreation in undeveloped, natural areas. Nonmotorized types of recreation have the lowest capacities because undeveloped, unroaded areas are scarce: the only area currently proposed for wilderness designation by the Federal government is the Tongue River Breaks, a 16,000 acre roadless area in the Ashland Division. Recreational use of this and other roadless land in the area is low, however.

3. Impacts of the Proposal

Western Energy Area E employees and their families would continue to place part of the demand on recreational facilities in Colstrip and Forsyth and on non-urban resources in Rosebud County and adjacent counties. No new source of demand would be created because continued mining at Area E would not increase employment.

More recreational facilities are needed in Forsyth and Colstrip to accommodate the increased demand from the population associated with Colstrip generating units 3 and 4. Newcomers frequently comment on a lack of "things to do". Increased litter at outdoor recreation facilities would probably reduce the level of enjoyment for some recreationists.

Area E is not currently used for any recreational purpose. (Western Energy Co., written commun., July 9, 1980). Mining would eliminate any potential recreational use of this land throughout mine life. Recreational access to the minesite after reclamation would be determined by Western Energy or any subsequent landowner.

N. CULTURAL RESOURCES

1. Summary of Impacts

The loss of six archeological sites and one historic site would not be significant because none are eligible for inclusion on the National Register of Historic Places. None of the sites are unusual for the northern Great Plains, and none provide important information about prehistory or recent history.

2. Description of the Existing Environment

There are six archaeological sites in Area E, according to a Bureau of Land Management survey conducted in 1978 (cited in Fredlund, 1979). None of the sites are eligible for listing on the National Register of Historic Places. (Robert Archibald, Acting State Historic Preservation Officer, written commun. to Donald Crane, U.S. Office of Surface Mining, April 11, 1980). Five of the sites are lithic scatters (places used to make or sharpen tools) and one is a petroglyph that has since disappeared. The historic site is an abandoned underground coal mine shaft. Old mine shafts are not unusual in the northern Powder River basin; the shaft in Area E contains no unique structures or architectural features. The five lithic scatters are very small, low density scatters with no subsurface materials. There is no potential to yield further information at the local level of prehistory. (Lynn Fredlund, Mineral Research Center, oral commun., May 5, 1980).

Area E was first inventoried for cultural resources in 1971. Subsequent surveys varied in their findings. The following discussion focuses on the more recent surveys.

In 1976 the area was surveyed under the direction of L. Lahren (cited in Fredlund, 1979) who reported four lithic scatters within the project area. A survey conducted in 1977 (Montana Department of State Lands, 1977) listed five archaeological sites in Area E, all of which were described as Ridgetop Occupation sites (lithic scatter areas). These sites were noted as WE #7, 8, 9, 10, and 25.

In 1978 the Bureau of Land Management resurveyed the area to verify the 1976 reports. Only three of the four lithic scatters (WE (#8, 9, and 10) were relocated. WE #7 was not relocated. In addition, the 1978 survey reported three previously unrecorded sites. Two were lithic scatters noted as WE #11 and #12. The third is the historic mine shaft described above, which was designated WE #13.

A poorly preserved petroglyph noted in the 1971 survey was recorded in 1973 as Alan's petroglyph. The site consisted of a single petroglyph panel on a sandstone outcrop. It possibly represented an animal with antlers. Deterioration of the figure was noted between 1971 and 1973 when the panel was traced on plastic film. The site was not relocated during the survey conducted in July, 1978. The figure had disappeared by 1979. This petroglyph site was of unknown cultural affiliation and could not be assigned to a particular time period with the current state of knowledge. It is doubtful that the panel was more than 500 years old based on the rate of deterioration of the sandstone (site report by Mineral Research Center contained in Western Energy's permit application). The rapid deterioration noted between 1971 and 1979 is not unusual in an area of heavy mine activity due to vibrations caused by blasting and heavy truck traffic (Howard Billian, Mineral Research Center, oral commun., May 28, 1980).

3. Impacts of the Proposal

The abandoned mine shaft (WE #13) would be mined out. Four lithic scatters (WE #7, 9, 10, and 11) would be covered by spoils in the highwall reduction area. One lithic scatter (WE #12) would be covered by soil storage. All of these sites would be effectively lost to future study. WE #8 is in an area which may be disturbed by associated mine activity such as vehicles. The loss of these resources would not be a significant impact because each site individually means very little to archeological knowledge. The distribution and location of the sites are important indicators of prehistory, but that information is recorded and would not be lost to mining (Lynn Fredlund, oral commun., June 11, 1980).

Undiscovered cultural resources may exist in the surveyed area and would be lost to mining, but the potential for significant undiscovered resources appears low, based on the intensity of surveys to date.

O. ESTHETICS

1. Summary of Impacts

Long term esthetic impacts would not be significant because the mine-site's esthetic value, which is not distinctive for the region, would be largely restored after mining.

2. Description of the Existing Environment

The proposed mining area, although visually pleasant, is not esthetically distinctive from the surrounding landscape. The gentle to moderately steep sloping terrain, sandstone outcroppings, native range vegetation, scattered clumps of ponderosa pine on the ridges, and natural drainages contrast sharply in color and texture and visually dominate the proposed mining area.

The landscape to be mined typifies large portions of eastern Montana. Undisturbed lands surrounding Area E contain similar and, in places, more striking visual features, including greater terrain variety, denser stands of ponderosa pine, and more profuse and colorful rock outcroppings.

Most people view Area E from highway FAP 39. Few, if any, people visit the undisturbed portion of Area E specifically to view its scenery. Current mining in Area E and the nearby Colstrip power plant limits the esthetic value of the undisturbed portion of the area. The unmined area along the highway provides little screening of active mining in Area E.

The noise of the highway traffic, adjacent mining, and the power plant is evident throughout the undisturbed portion of Area E.

3. Impacts of the Proposal

Mining would create a sharp distinction between undisturbed areas and areas of stripped vegetation and topsoil. The mine cut and spoil piles would substantially change the form, color and texture of the area. The esthetic value of the slopes, sandstone outcroppings, ponderosa pine, rolling grassland, and natural drainages would be eliminated during mining. Regrading, revegetation, and reclamation of the mined area to approximately the original topography would substantially reduce long term impacts.

Reclaimed areas would contrast with the surrounding undisturbed areas, creating a strong unnatural line where they adjoin. This contrast would be evident because the reclaimed areas would have less form, texture, and color variation than the undisturbed lands.

The proposed mining would further reduce the screening of existing mining and associated disturbance as seen from the highway. After mining and reclamation, the noise of the nearby dragline and blasting would be gone, but industrial sounds from the power plant and traffic noise from the highway would remain.

CHAPTER III

ALTERNATIVES TO APPROVING THE PERMIT AS PROPOSED

This chapter considers alternatives to approval of Western Energy Company's proposed mine plan. The administrative alternatives available to the Department of State Lands include taking no action, denial of the permit, selective denial of portions of the permit, and approval of the permit subject to stipulations. Possible stipulations which would reduce environmental impacts are identified in chapter II as mitigating measures. Any of these alternatives could be chosen if necessary to reduce the environmental impacts of the proposed mining or to comply with legal requirements and the lease terms.

This chapter also discusses technological alternatives to the proposed strip mining of coal. The Department does not have the authority to require Western Energy to adopt any of these technological alternatives.

A. ADMINISTRATIVE ALTERNATIVES

1. Department of State Lands

a. No action

If no action were taken by the Department within 240 days after receipt of a complete application for a mining and reclamation permit, the permit would be statutorily approved by default.

Montana also does not have a formal administrative alternative to "defer action" following the receipt of a completed application for a mine and reclamation permit. However, the State may deem an application incomplete due to failure of the mine plan to meet State requirements, leading to a postponement of the action, which has the effect of deferral. Western Energy's application for Area E had not been deemed complete at the time this EIS was published. The changes that must be made in the application would not appreciably affect the analysis in this EIS.

b. Disapprove the permit

The Department may reject a proposed plan that does not meet Montana's permanent regulatory program (ARM 26.4.301 et. seq.). If Western Energy's current permit application were denied and no further permits were issued for Area E, the company would have to end its Area E operations in 1981, when the coal currently permitted for mining ran out.

Permit denial would prevent mining of 276 acres of Area E. All of those acres are currently bonded for lesser disturbance such as haul roads and highwall reduction under Western Energy's current permit.

Western Energy would likely propose an alternative mine plan within Area E if the current permit application were denied. The impacts of such a revised plan cannot be determined at this time. Until a revised

mine plan were submitted and approved, the undisturbed portion of Area E would continue in its present condition, subject to modification by natural processes and by such nonmining uses as Western Energy might undertake.

Western Energy would have several options if mining in Area E were to cease. The company could truck coal from Areas A or B across the access road to Colstrip generating units 1 and 2. Production from Areas A or B would have to be expanded or else sales to out-of-state customers curtailed. There is no evidence that replacing Area E coal with Area A or B coal would reduce total environmental impacts from the Rosebud mine; the different mining areas operate under similar physical and social conditions.

Western Energy could build a receiving facility at Colstrip and ship in coal from a different mine. This would be expensive. The net difference in environmental impacts under this alternative cannot be predicted.

If Western Energy were not to replace Area E coal from another source, its parent company, Montana Power, would have to shut down Colstrip units 1 and 2. Montana Power would lose 30 percent and Puget Sound Power and Light 36 percent of their total generating capacity. To maintain the existing level of service to its customers, the two utilities would have to buy power elsewhere, with unknown environmental consequences.

Western Energy would still have the option of applying for mining permits on its undeveloped leaseholds, which could eventually supplant Area E coal. A new mine could not produce for at least several years, during which time one of the above options would apply. There is no evidence that mining a different part of Western Energy's leasehold would have lesser environmental impacts than mining Area E.

Summary of impacts under no permit scenario.

All but 23 acres of the 450-acre proposed permit area are currently bonded for associated disturbance. If the proposed permit were denied, Western Energy would disturb 160 acres of that area to reduce the existing highwall from the existing mining operations. Little additional land would be mined under the existing permit because the mine would shut down in 1981. All disturbed lands would be reclaimed and would probably support similar vegetation, wildlife, and land uses as if the same area were mined as proposed.

Hydrologic impacts would be somewhat less than if the permit were approved: seepage of saline water from impoundments could continue to slightly reduce agricultural productivity along Cow Creek for 10-20 years instead of 15-25 years. Seepage through the replaced mine spoils would probably extend this impact for the long term, although not as much as under the proposal because only half the volume of spoils would be created.

The six archaeological sites and the historical site would probably not be disturbed because they are outside the area to be mined under the existing permit.

Western Energy would have to truck more coal from Area B across FAP 39 to the Colstrip generating units, continuing the potential for disruption of traffic and serious accidents. Ten coal haulers would cross the highway every daylight hour for at least several years, compared to nine/hour during 1980.

Particulate and gaseous emissions from the mine would end 4 years sooner if the permit were denied. If production from Area E were replaced from Area B, particulate and gaseous emissions from coal hauler trucks would increase slightly because of the slightly greater haul distance.

Employment would not decrease if Western Energy increased production at Area B to compensate for lost production at Area E; consequently, social and economic impacts would not substantially differ from those under the proposed plan.

c. Selective denial

The Department could deny the permit to mine in a specified area having special, exceptional, critical, or unique characteristics, or where mining would affect the use, enjoyment, or fundamental character of neighboring land having the above special characteristics. The impact analysis contained in this EIS has not disclosed any such lands in or near Area E, but that does not preclude such action following review of this EIS.

d. Approve the permit with stipulations

Western Energy could be required to follow any of the mitigating measures discussed in chapter II and summarized below. The requirement would be in the form of stipulations attached to a permit.

1) Air quality

Coal dust emissions could be substantially reduced by watering the coal storage pile and using a baghouse in conjunction with the coal handling facilities (table II-5). If all the Best Available Control Technology (BACT) measures were implemented, coal dust emissions would be reduced from 400 tons/year to 116 tons/year, a 71 percent reduction. This would reduce potential health hazards to mine workers but would only slightly reduce ambient particulate concentrations at Colstrip.

Western Energy Company is presently using the BACT for the reduction of fugitive noncoal dust emissions (table II-5; U.S. Environmental Protection Agency, 1979). Minimization of the fall distance from the dragline during overburden replacement could reduce dust somewhat.

2) Soils

Western Energy currently plans to salvage the Cabbart and Yawdim soils to a depth greater than the average soil thickness. This would result in taking siltstone and shale bedrock material, which is not suitable for plant growth. DSL could require the company to salvage those series only to bedrock.

3) Hydrology

Western Energy could be required to drill wells downgradient of Area E to capture mine spoil seepage returning to sedimentation ponds, thereby reducing off-site impacts. Another method of reducing contamination of ground water from saline spoils would be the selective placement of saline spoils between the ground water zone and the rooting zone.

Additional water quality sampling in the Cow Creek drainage would help determine to what extent existing mining is degrading surface and ground waters. Sampling prior to additional seepage of mine spoils would also provide documentation of any future water quality impacts. Modeling of ground water with and without mine spoils would greatly aid assessments of hydrologic impacts. The additonal investigations could be required under provisions of the Montana Strip and Underground Mine Reclamation Act (82-4-222, MCA).

For discussion of selective placement of overburden see chapter II, Hydrology, Mitigating Measures.

B. TECHNOLOGICAL ALTERNATIVES

1. Alternative Mining Methods

Because Western Energy plans to complete mining at Area E in 1984, drastic changes in mining methods such as underground mining, contour mining, augur mining, or truck-and-shovel mining do not appear to be warranted. None of these alternative methods of extracting coal would significantly reduce environmental impacts at Area E, and all would be time-consuming and expensive to institute. DSL cannot require specific mining methods except as necessary to mitigate environmental impacts.

The Department could require Western Energy to mine the McKay coal seam which underlies the Rosebud seam, should the seam be proven to be marketable. DSL has to date been unable to prove whether the seam is marketable. Western Energy has not found a suitable market for the McKay coal due to the coal's tendency to form slag in some steam boilers. McKay coal, either alone or blended in large quantities with Rosebud coal, may not be useable in Colstrip generating units 1 and 2 or the Corette plant, the current consumers of Area E coal. The possibility

exists that Western Energy could find a buyer for McKay coal or blended Rosebud-McKay coal; DSL will continue to encourage Western Energy to find such a market. Selling McKay coal alone from Area E would require separate handling of the coal. Blending the Rosebud and the McKay coal for sale outside Montana would at times require Western Energy to truck Rosebud coal from a different part of the Rosebud mine to the Area E surge pile, which feeds generating units 1 and 2.

Mining both the Rosebud and McKay seams at Area E would recover about one-third more coal per acre disturbed than mining the Rosebud seam alone. This would extend the life of Area E perhaps 2 years, thus delaying the requirement for coal from a new area of the Rosebud mine. Environmental impacts at Area E would not be appreciably increased: the major difference would be a greater need for fuel and electricity to remove the interburden and extract the additional coal. Because of the difficulty of regrading the additional waste material, the reclaimed land surface might be geomorphically less stable. Mining the McKay coal at Area E could, on the whole, have less environmental impact than mining additional land to produce an equivalent amount of coal.

Western Energy has planned its Area E operations around mining the Rosebud seam alone; mining the McKay seam would require considerable engineering changes which would lead to a temporary production delay at Area E during the changeover.

2. Alternative Energy Sources

Because coal from Area E feeds the existing Colstrip and Corette generating plants, which will be in operation well past 1984, it does not appear likely that other sources of energy will replace the demand for Area E coal. Alternative sources of energy, including nuclear, solar, and geothermal could well reduce the need for new coal-fired power plants but are not expected to replace electricity from plants now in operation.

A nationwide program of energy conservation could significantly slow the rate of growth of electric energy use, but conservation would not likely make existing generating facilities obsolete in the next 4 years, which is the projected remaining life of Area E.

CHAPTER IV

COMMENTS ON THE AREA E DRAFT EIS

AND

RESPONSES OF THE DEPARTMENT OF STATE LANDS

WESTERN ENERGY COMPANY

404 N. 31st / BILLINGS, MT. 59101 / (406) 252-2277

April 10, 1981

Mr. Ralph Driear
Environmental Administrator
Department of State Lands
Capitol Station
Helena, MT 59601

Dear Ralph:

Western Energy Company is submitting the attached comments concerning the Draft Environmental Impact Statement for the Rosebud Mine - Area E Extension. We have commented in a format which identifies the specific section, page number and paragraph of the area of concern. We hope this will aid you in your review process.

As you review our comments, you will notice we have submitted numerous comments regarding the hydrology discussion, Section B of Chapter II. Repeatedly the DEIS narrative refers to probable significant impacts of the additonal mining of Area B and D in relation to Area E.

It is Western's intent to obtain sufficient data which will better define the relationship of our mining operations and the hydrologic regime. To do this, Western has, in cooperation with the Department of State Lands, initiated a comprehensive mine wide monitoring program. The data generated from this program is available to the Department, and therefore the EIS team, in the Hydrologic Resource Data Volumes updated quarterly and compiled annually. Through this cooperative program, a better understanding of the Colstrip hydrologic system and mining impacts will develop.

Western hopes the enclosed comments will be received as a continuation of the cooperative effort between all parties concerned to better define the environmental impacts associated with proposed further mining at the Rosebud Mine. If your staff has any questions concerning the material submitted, please contact us.

Sincerely,

Sherry E. Schwend

Sherry E. Schwend
Permit Coordinator

SES:it

cc: Rick Dale
Gary Amestoy

RECEIVED
APR 13 1981
STATE LANDS

Western Energy Company
SMA #00088
DEIS Comments

Section A. Scope of Analysis, Page I-1, Paragraph - 5.

1 COMMENT:

The application for an air quality permit referenced here was approved by the DHES on November 26, 1980. The document was assigned Permit Number 1483 and was made available to the DSL at the same time.

4/8/81 - CC

1

1 The Air Quality Bureau of the Department of Health and Environmental Sciences issued air quality permit #1483 to Western Energy Company for areas A, B, and E on November 26, 1980.

Western Energy Company
SMA #00088
DEIS Comments

Section B, Hydrology, Page II-8, Paragraph - 5.

2 COMMENT:

The effects of the Area E extension on the chemical quality of ground or surface waters will be minimized by reclamation and reseeding. Evapotranspiration from revegetated spoils will return most of the precipitation falling on them to the atmosphere, so the amount of ground-water recharge under post mining conditions will be similar to pre-mining conditions. With very little vertical percolation through the reclaimed spoils most of the salts in the profile will not be mobilized. Significant measurable impacts to Cow Creek are not expected to result from mining the remaining portion of Section 2. Previous mining in Area E which began prior to collection of any hydrologic baseline information has made it difficult to assess the possible extent of any hydrologic impact to the Cow Creek drainage.

4/8/81 - PN, DCP

2 Very little precipitation will infiltrate the spoils, but ground water moving horizontally through the base of spoils will pick up salts. While old mine spoils will be the major source of salts eventually reaching Cow Creek, the Area E extension would increase the amount of spoils through which ground water would move by 11 percent, thus increasing the salt loads of Cow Creek. (See chapter II, Hydrology, Impacts of the Proposal.)

Western Energy Company
SMA #00088
DEIS Comments

Page II-9, Paragraph - 4.

3 COMMENT:

By definition water which recharges a groundwater aquifer is not used by plants. By the same token, the definition for nonirrigated native range would mean it is not augmented by subirrigation from the alluvium. Western questions the meaning of this statement; which interpreted means that possible subirrigation exists in the narrow discontinuous band of deciduous tree and shrub vegetation along the ephemeral channel. This statement needs to be further clarified.

4/2/81 - DCP

3

3 The wording of this paragraph has been changed for the final EIS.

Western Energy Company
SMA #0008B
OEIS Comments

Page II-9, Paragraph - 5.

4 COMMENT:

Areas under cultivation along Cow Creek to the east of Area E have been determined by digitizing from three separate sets of air photos. The upper field consists of about 35 acres under cultivation; the lower field contains about 95 acres under cultivation. The amount of acreage potentially flood irrigated by the existing spreader dikes is substantially less than the total area of alfalfa in the lower field. Although the maximum area potentially irrigable is difficult to determine without better topographic coverage, it may be as much as 17 acres. The area indicating increased vegetative vigor from possible flood irrigation indicated by color infrared photos during the period 1973 through 1980 is about 6 acres. Bailey Egan (oral communication February, 1981) indicated that although the lower field contained about 100 acres it was possible to irrigate only a portion of this field with the existing dikes. Western has one other comment on this statement concerning the use of the term "flood plain". Flood plain is not a term easily applied to the headwater tributaries of ephemeral drainages in semi-arid areas such as southeast Montana. The cultivated fields along Cow Creek are underlain in part by alluvium, but to state that the upper field is "planted along the flood plain" is not correct. The field lies on valley fill well above the incised channel and "flood plain" of the ephemeral tributary.

4/8/81 - DCP

4

4 Air photos of Cow Creek indicate that only a portion of the 100-acre alfalfa field (i.e., the lower field) is along the flood plain of Cow Creek, as Western Energy Company points out. Fifteen to twenty acres of the 100-acre field may be flood irrigated during high runoff; 5 to 10 of these acres appear to be subirrigated, as Western Energy Company mentions.

The upper alfalfa field does appear to be completely out of any flood plain and does not appear to be subirrigated. The final text has been changed to incorporate Western Energy's comments.

Based on color infrared photos, there appears to be considerable acreage along the flood plain of Cow Creek that has higher vegetative productivity than does the surrounding landscape. Natural flooding or subirrigation probably account for this. While the total acreage along Cow Creek that has naturally higher vegetative productivity because of the additional availability of surface and subsurface water has not been determined, preliminary review of available infrared photos indicates that it could exceed 50 acres.

Western Energy Company
SMA #00088
DEIS Comments

Section B, cont'd., Page II-9, Paragraph - 6., Page II-10, Paragraph - 1.

5 COMMENT:

Western Energy questions the use of the term "intermittent aquifer"; this term is not in standard use in the field of groundwater hydrology and does not accurately portray the situation in the Colstrip area. Sandstone units in the Rosebud overburden and Rosebud-McKay interburden locally contain water, but are not areally extensive. Sandstone is thought to have been deposited as channel lag and point bar deposits in the Paleocene Tongue River Member of the Fort Union Formation (Oollhopf etal, 1979). These type of deposits are invariably discontinuous (Renick and Singh, 1973), and this seems to be the case in the Colstrip area. Water bearing zones in the Rosebud overburden and the Rosebud-McKay interburden material appear primarily to be contained in lenticular sandstone bodies surrounded by less permeable siltstone material. The water bearing sandstone zones probably act as reservoirs with very slow flow and recharge rates. Water bearing zones in sandstone lenses show little seasonal fluctuation in water levels. The Rosebud overburden and the Rosebud-McKay interburden are not considered to be aquifers in the Colstrip area. Western feels that perhaps it would be better to refer to these stata as containing discontinuous water bearing zones.

4/8/81 - DCP

5

5 The term "discontinuous water bearing zones" better describes the wster-carrying characteristics of the Rosebud overburden and Rosebud-McKay interburden; the text has been revised accordingly.

Western Energy Company
SMA #00088
DEIS Comments

Section B, cont'd, Page II - 10, Paragraph 4.

6 COMMENT:

The calculation of flow through the Rosebud aquifer is based on transmissivity determined by aquifer testing and groundwater gradient as determined from water level records and aquifer width. The few gallons per minute estimated flow through the coal are not observed to discharge in the pit face which may indicate evaporation from the pit face, drawdown at the pit face or possibly interception of flow by mining upgradient in Area B. The contention that flow would be higher were it not for mining in Area B assumes interception of water by spoils in Section 3. The potentiometric map (Figure II - 4, page II - 11) shows that groundwater enters Area E primarily from the south and southwest rather than directly from the west. The current situation of no observable discharge through the exposed Rosebud coal seam may indicate some interception; if this is the case recharge of the spoils could only increase flow back to the capacity of 2 to 3 gpm that is determined by aquifer characteristics. It is not likely that mining upgradient and ultimate recharge of the spoils will result in any larger flow through Area E than now occurs.

4/8/81 - DCP

6

6 The estimate of the amount of ground water in the Rosebud aquifer that would be passing through Area E has been revised slightly. The low estimate presented in the final EIS is 2.5 gpm and is based on a transmissivity of 60 gpd/foot and a gradient of 20 feet/mile. The high estimate of 13 gpm is based on a transmissivity of 127 gpd/foot and a gradient of 50 feet/mile. The amount of ground water passing through Area E is difficult to pinpoint exactly for two reasons: (1) the coal is fractured in certain localities, increasing the ability of coal to transmit water and (2) the amount of drop in ground water head over over a given distance (gradient) varies throughout the area, which in turn changes the flow rate.

Calculations of the rate of evaporation of ground water seeping along the pit walls indicate that most of the estimated flow in the Rosebud coal and the overburden in Area E would evaporate (Wayne VanVoast, oral commun., June 1981). The three factors listed in Western Energy's comment are likely reasons for the the lack of substantial seepage in pit highwalls of Area E.

Drawdowns caused by mining in Area B have modified the potentiometric surface of the Rosebud aquifer (Dollhopf and others, 1978b). In particular the potentiometric gradient east of Area B has been flattened; therefore, less ground water is now flowing from Area B to the northern part of Area E than was flowing prior to mining. The amount of ground water flowing into the southern part of Area E probably has not changed appreciably. The magnitude of the total reduction in flow to Area E caused by mining in Area B is unknown.

Western Energy Company
SMA #00088
OEIS Comments

Section B, cont'd., Page II - 12, Table II - 2.

7 COMMENT:

Additional data available to the Department has not been included in this table. Transmissivity data for the interburden presented by Botz (1978) for McKay overburden near the MPC ponds includes some wells completed in alluvium and partially completed in spoil. Interburden transmissivity reported by Botz (1978) appears to be higher than the average for other wells near Colstrip and probably is not representative of the Rosebud-McKay interburden in Area E.

The most recent Western Energy Company data for interburden wells (WI - 102, 103, 104 and S - 23) indicates a range of total dissolved solids of 684 to 2700 mg/l with an average value of 1907 mg/l (HROV II, Section J). Aquifer test data for six interburden wells (HRDV II, Section H) suggest an average transmissivity value of 20 gpd/ft. Water level data indicate a hydraulic gradient for the interburden across Area E of from 12 to 30 ft/mile. Using these data, the average flow through the interburden is 0.03 to 0.08 gpm/1000 ft and the flow through Area E is about 0.3 to 0.9 gpm.

Water level data for the McKay coal seam indicate hydraulic gradient values of 13 to 28 ft/mile through Area E. The average transmissivity for the McKay coal based on testing of seven wells in the Colstrip area is 31 gpd/ft. (HRDV II, Section H). Using these data, the computed flow rate in the McKay is 0.05 to 0.11 gpm/1000 ft. or 0.5 to 1.2 gpm through Area E.

4/8/81 - DCP

7

7 Table II-2 has been revised to incorporate these comments.

Western Energy Company
SMA #00088
DEIS Comments

Section B, cont'd., Page II - 13, Paragraph - 2.

8 COMMENT:

Calculation of flow rates in Rosebud overburden is complicated by the heterogeneous nature of the overburden material. As discussed previously sandstone within the overburden consists of lenticular discontinuous bodies surrounded by more fine grained material. Calculations using transmissivities from a few wells must assume a generally homogeneous material which does not exist. A more realistic assessment of flow in the overburden comes from examination of the exposed strata in the existing pit. As discussed in the Area E permit application, examination of the pit walls in 1980 reveal a flow of only a few gpm at the most. This empirical observation indicates the quantity of flow in overburden through Area E is most certainly in the low end of the range postulated.

4/8/81 - DCP

8

8 The amount of ground water seeping from the walls of existing pits is not a good indication of flow in the overburden, because seepage would be reduced by evaporation and drawdown. In eastern Montana, seepage at a rate as high as 10 gpm easily could be lost to evaporation (Wayne VanVoast, oral commun., June 1981). Considering this, flow within the overburden must be higher than a few gallons/minute just to compensate for evaporation loss; any seepage would indicate that ground water flow is probably greater than 5 gpm. In the final EIS, the range of Area E overburden flow rate is revised slightly from the 0.5 to 14 gpm identified in the draft EIS to 2.4 to 7.5 gpm (see table II-2).

Western Energy Company
SMA #00088
DEIS Comments

Section B, cont'd., Page II - 13, Paragraph - 4.

9 COMMENT:

Western's records (HRDV II, Section I) indicate a range of total dissolved solids for interburden water of 684 to 2700 mg/l, and an average value of 1904 mg/l. High dissolved solids concentrations in the interburden are localized in the vicinity of MPC's flyash ponds and are not considered representative of regional interburden water quality.

4/8/81 - PN, DCP

9

9 The values identified by Western Energy Company have been incorporated in table II-2 and the related text. We agree that the values for total dissolved solids reported by Botz (1978), which averaged over 4,500 mg/l, result from seepage from Montana Power Company's flyash ponds.

Western Energy Company
SMA #0D088
DEIS Comments

Section B, cont'd., Page II - 14, Paragraph - 2.

10 COMMENT:

Western Energy interprets this reference to "identified sources of seepage" to mean locations at which collected surface water or pumped pit water seeps or discharges to underlying materials. Ponds A and B shown on Figure II - 1 occasionally receive surface runoff and seep water to underlying materials. Pond A has been shown to contribute recharge of good quality water to the McKay coal. The ponds on the eastern side of Area E, collect runoff from small areas but usually maintain some water and have developed a marshy appearance. Water level data indicates that water levels in these ponds are maintained by a local groundwater table and do not depend on surface water runoff or on pumped pit water. Because these ponds are essentially discharge sites rather than recharge sites, seepage from the pond bottoms is not likely to occur. As the water in the ponds moves downstream it is then, however, able to recharge to underlying strata.

4/8/81 - DCP

10

10

DSL agrees that the ponds located along the eastern margins of Area E (ponds labelled E1, E2, F2, and F3 in fig. II-1) are probably fed by ground water. The potentiometric levels in the McKay coal seam and the nearby spoils indicate that the ground water table closely corresponds to the water level in the ponds. The quality of water in the eastern ponds and the adjacent spoils are very similar, indicating that the spoils are seeping into the ponds. The upward movement of spoils water into the ponds does not preclude ground water from moving to the east, as Western Energy Company's comment indicates, thereby adding poor quality waters to tributaries of Cow Creek.

Spoils, not the ponds, are the major source of degraded water seeping out of Area E. However, the ponds are in the path of eastward-moving spoils water. (See revised text chapter II, Hydrology, Current Mining Impacts.)

Western Energy Company
SMA #00088
DEIS Comments

Page II - 14, Paragraph 3.

11 COMMENT:

Western Energy has only rarely pumped water from the Area E pit to other locations. Water is usually maintained in these ponds by the existing water table. The increase in TDS as the water moves through the paired ponds is probably due primarily to evaporation from the pond surface and transpiration by riparian vegetation.

4/8/81 - DCP

11

11

Thank you for this information. TDS levels in the lower ponds were very similar to levels in the adjacent spoils. The poor quality pond water is probably due to mine spoil water seeping into them--not totally to evaporation, as Western Energy Company indicates. In the final EIS, water quality impacts from the Area E extension are based less on the ponds as a source of pollution and more on the potential impacts of ground water passing through mine spoils and into Cow Creek.

Western Energy Company
SMA #00088
OESI Comments

Page II - 14, Paragraph 14.

12 COMMENT:

The ponds on the east side of Area E are water table controlled. Inert seepage from these ponds is not likely. Downstream in the marshy channelized ditches water may seep to underlying bedrock or thin valley fill. Groundwater inflow to these ponds from spoils is estimated based on existing data. The hydraulic gradient in spoils in Area E is about 30 ft/mile and the average transmissivity of spoils is about 167 gpd/ft. (Van Voast etal, 1977). With an average saturated thickness of about 4.0 feet the permeability of the spoils is about 5.6 gpd/ft^2. Assuming that the average seepage face where spoils discharge to a pond is about 10 ft. by 150 ft, the total discharge to each pond will be about 0.4 gpm.

Surface water entering these ephemeral tributary headwaters has been intercepted by mining cuts for several decades. The inference of this paragraph is that both surface water runoff and groundwater inflow to the above pit are routinely pumped to the ponds. This is not the case. Water is pumped to these ponds rarely if at all. In addition Western considers both the estimated groundwater and surface water inflow to the pit to be high.

The suggested groundwater inflow of 3-17 gpm is not observed in the exposed pit wall and the sum of calculated inflows from Rosebud coal (2-3 gpm) and Rosebud overburden (1-14 gpm) is not realistic. Groundwater

12

12

Further analysis of the hydrology of Area E has shown that seepage from the ponds is not as important a part of the hydrologic impact of mining in Area E as was originally believed; seepage from all parts of Area E is a more significant impact. Therefore, much of the discussion of the ponds has been eliminated in the final EIS.

DSL does not agree with Western Energy's calculation of the rate of inflow of water from the spoils to the ponds; the calculation does not take into account the upward component of flow in the spoils or the fact that the saturated thickness of spoils is greater than 4 feet.

DSL has recalculated the amount of ground water that would be asaumed to pass into Area E based on average transmissivity values. The revised estimate (3-13 gpm) is slightly lower than the eatimate in the draft EIS (3-17 gpm). It is important to note, however, that these are merely estimates based on average transmissivity values for wells throughout the entire Rosebud mine; the actual flow rate could be greater or less. In any case, the fact that the pit highwall is wet indicates there is some ground water flowing into Area E.

The range of ground water flow rate presented in the final EIS is not much different from the range presented in the draft, and either set of numbers can be considered a reasonable guess. The range of flow rate presented by Western Energy Company (3-6 gpm) probably represents a low estimate because this small an amount of water likely would be removed from pit walls by evaporation and would never form a seep (see response A8).

inflow of perhaps 3 to 6 gpm, much of which evaporates in the pit wall, is much closer to inflows observed during many years of mining in Area E. Surface water flows from a drainage containing an area of unreclaimed spoils topography can not be assumed to produce runoff of the same magnitude as undisturbed lands.

4/8/81 - DCP

The final EIS does not focus on the ponds to the extent the draft did. This particular statement was deleted from the final text.

Western Energy Company
SMA #00088
DEIS Comments

Page II - 16, Paragraph 1.

13 COMMENT:

Western agrees that a greater saturated thickness and width of spoils will probably exist when the whole of Area E is reclaimed and spoils become resaturated. However, this will occur regardless of the current proposal to mine the additional area in Section 2. The ponds and cut channels on the east side of Area E constructed by the NPRR are essentially at the Rosebud outcrop and the water table at these locations is near the surface. Spoils water levels will establish equilibrium with this discharge situation and may have already done so in old spoils on the eastern side of Area E. Water quality and water quantity discharged from spoils to downgradient and underlying materials are not likely to be significantly different if Section 2 is mined or left undisturbed.

4/8/81 - OCP

13 The Area E extension would add 276 acres of spoils to existing spoils. In considering the impacts of mining on off-site areas, both existing and new spoils must be taken into account. The Cow Creek drainage would be affected by degraded ground water moving downgradient from the majority of spoils. The acreages of spoils that will affect the Cow Creek drainage are as follows:

	Approximate Acreage
Mined-out area: Area E	1,300
Mined-out area: Pit 3	300
Mined-out area: Area B, section 3	335
Area permitted but not mined: Area B, sections 4, 9, and 10	655
Proposed Area E extension	276
	2,866

The Area E extension will increase the spoils acreage upgradient of Cow Creek from roughly 2,590 acres to roughly 2,866 acres, or 11 percent. The spoils that already exist or that will be created by mining in permitted areas are expected to increase salts in the surface water and alluvial ground water of Cow Creek by 5 to 35 percent. Salts from permitted areas are expected to reduce vegetative productivty on naturally and man-irrigated fields along Cow Creek. Although the Area E extension would add only 11 percent more spoils, the addition of any more salts to Cow Creek would further reduce vegetative productivity.

The cumulative impacts of continued mining upgradient of Cow Creek in mine areas B and D also could add salts to Cow Creek, making the cumulative impacts of future mining at the Rosebud mine even more significant. The amount of spoils that ground water would pass through before reaching Cow Creek could nearly double, and so could the salt loads. (See chapter II, Hydrology, Impacts of the Proposal.)

Western Energy Company
SMA #00088
DEIS Comments

Page II - 16, Paragraph 2.

14

Western is concerned that the small amount of surface water quality data presented has been misinterpreted. The good quality water from Coalbank Coulee (500 mg/l) appears to be from spring snowmelt or storm events and represents typical surface water flows in the headwaters of ephemeral tributaries. The data attributed to Pony Creek is in fact from an alluvial well (WA-112) and represents water of similar quality to the Rosebud coal which subcrops to the alluvium near that site. The data from Cow Creek appears typical of base flow standing water or spring discharges to other ephemeral and intermittent streams in the Colstrip area. The most upstream site appears to be from a spring where the McKay coal discharges to the surface or to Cow Creek alluvium. The reported TDS of 3020 mg/l is similar to that of other "McKay" springs sampled by Western in the headwaters of Cow Creek in 1981. This amount is similar to the range of values for surface water from E. Fork Armells Creek and groundwaters from E. Fork Armells Creek above mined areas. The samples further downstream seem to indicate a decrease in water quality in the downstream direction which may result from inputs of poor quality water from bedrock units or agriculture. If these samples represented basin wide surface water flow events, downstream dilution would be expected to improve water quality if the mine area was a significant headwater pollution source. The decrease in water quality many miles downstream and stratigraphically substantially below the mining disturbance suggest another source or sources of the poor quality water found in lower Cow Creek rather than the mining operations.

15

14 After reevaluating the draft EIS, DSL concludes that existing surface water quality does not indicate whether or not mining is a cause of poor quality water in Cow Creek. Samples have not been taken at frequent enough intervals or in enough locations to make such a determination. The analysis has been revised to compare alluvial water of areas downgradient from mine areas with alluvial water from drainages not affected by mining. (See chapter II, Hydrology, Description of the Existing Environment and Current Mining Impacts.)

Page II - 16, Paragraph 2, (Comment cont'd.)

It is unlikely that significant snowmelt or storm runoff events would produce water of the poor quality reported downstream. Although base flows in lower Cow Creek may pose a danger to livestock and would be unsuitable for irrigation, flows of a magnitude large enough to utilize present flood irrigation structures would probably be of better quality.

Because a large percentage of the percipitation falling on the old unreclaimed spoils infiltrates, percolates downward, and eventually reaches the water table, the old spoils would be the primary source of salts reaching Cow Creek. In view of the length of time that the old spoils have been in existence, if water with a total dissolved solid of 5000 - 6000 mg/l was going to reach Cow Creek, it would be evident in the sample from 1N42E, 31 C (Figure II - 5). This sample has 3020 mg/l total dissolved solids which is within the range of values found in surface water in East Fork Armells Creek and shallow groundwaters throughout the Colstrip area. If the transmissivity of Cow Creek alluvium is similar to East Fork Armells Creek alluvium (average value about 12,200 gpd/ft) and assuming a thickness of about 20' and a gradient of about 40 ft/mile (average gradient of the floor of Cow Creek) the time for water to travel through the alluvium from the old spoils to the spring in the SW¼ Section 31 would be about 37 years. Since this type of water (5000 - 6000 TOS) has not been found in the upper portion of the Cow Creek drainage it could be postulated that poor water quality in lower Cow Creek comes fom a source other than mining in Area E.

4/8/81 - PN, DCP

Western Energy Company
SMA #00088
OEIS Comments

Section B cont'd., Page II - 16, Paragraph - 5.

15 COMMENT:

The increase in total dissolved solids in the surface waters in lower Cow Creek may be interpreted to imply a downstream source of salts such as the Lebo shale which outcrops in the lower reaches of the drainage. The downstream decrease in surface water quality may also result from concentration by evaporation or by surface water inputs of poorer quality water, possibly from agricultural sources. Livestock use, irrigation returns and the cultivation and complete damming of the channel in Egan's lower field may all contribute to the degradation of Cow Creek water quality.

The McKay coal seam outcrops in the Cow Creek valley and discharges to springs in the drainage. The average total dissolved solids for waters from wells at the eastern edge of the old spoils (S-03, S-08, S-11 and S-12) is 2301 mg/l; average TOS of spring sampled by Western in spring, 1981 in the upper Cow Creek drainage is about 3000 mg/l. This indicates that the McKay aquifer the next significant aquifer below mining disturbance in Area E, is not a major contributor to poor (5000 mg/l TDS) water quality in lower Cow Creek.

4/8/81 - PW, OCP

15 Mining probably is not a significant contributor of salts to Cow Creek at present, but mining is or appears to be degrading both nearby ground water and shallow alluvial ground water in two tributaries to Cow Creek and one tributary to South Fork Cow Creek (see revised text). Ground water in the McKay and Rosebud coal seams east of Area E also have been degraded by mine spoils. When mining in Area E stops, existing and future mine spoils are expected to significantly affect water quality in Cow Creek.

Western Energy Company
SMA #00088
DEIS Comments

Section 8, cont'd., Page II - 18, Paragraph - 2.

16 COMMENT:

Much of the precipitation falling on old spoils may infiltrate and percolate downward to the water table (picking up available salts in the spoil profile). Reclamation of the area to be mined in Section 2 will mitigate or prevent most hydrologic impacts because most of the precipitation falling on the reclaimed spoils will be returned to the atmosphere by evapotranspiration and salts in the spoil profile will not be mobilized. Any significant mining effects on water quality of Cow Creek would have already occurred. The effects of old unreclaimed spoils will probably continue until all of the leachable salts have been mobilized (possibly 100's or 1000's of years) or until the spoils are reclaimed.

4/8/81 - PN

16 We agree that most precipiation will be lost to evapotranspiration from regraded and revegetated spoils. Research conducted at Area B showed very little or no vertical recharge occurred, even in a very wet year (Doug Dollhopf, oral commun., July 1981). However, we do not agree that reclamation of section 2, as proposed by Western Energy Company, would totally mitigate or prevent all hydrologic impacts. Western Energy assumes that reclamation of spoils will greatly reduce degradation of spoil water quality, but this is not verified by data from Area B and Peabody's Big Sky mine. Data from these areas, which were reclaimed shortly after mining, indicate that spoil water quality is as bad or worse than that found in parts of Area E left unreclaimed for many years. Lateral and upward flow from bedrock aquifers provide most of the recharge to spoils.

DSL also disagrees with the statement that any significant mining effects on water quality of Cow Creek would already have occurred. It appears that salt loading has occurred in two tributaries to Cow Creek and in the headwaters of South Fork Cow Creek. Additional salt loading will not occur until full ground water flow through Area E is reestablished after the mine pit is backfilled. Existing mine spoils are expected to have significant adverse effects on water quality and vegetative productivity in Cow Creek. The creation of any additional mine spoils through which ground water must pass would add to the salt loading of Cow Creek at least for centuries, and probably longer.

Western Energy Company
SMA #00088
OEIS Comments

Section B, cont'd., Page II - 19, Paragraph - 1.

17 COMMENT:

Most of the precipitation falling on reclaimed spoils will be returned to the atmosphere by evapotranspiration and very little would infiltrate vertically. Water moving horizonitally through the basal rubble zone would probably flush the leachable salts from that zone within a few tens of years.

The proposed mine extension would increase the total surface area of spoils in Area E by about one-third. Reclamation would mitigate detrimental effects on water quality in drainages east of Area E.

4/8/81 - PN

17 See response A16.

Western Energy Company
SMA #00088
DEIS Comments

Section B, cont'd., Page II - 19, Paragraph 3.

18 COMMENT:

Significant hydrologic impacts to the Cow Creek drainage are not likely to occur from the cumulative effects of future mining in Area D. The Rosebud coal in Area D outcrops several hundred feet above the Cow Creek valley, and based on existing data, appears to be essentially dry. No springs or seeps are known to discharge from the Rosebud coal within the Cow Creek drainage. Existing information indicates mining Rosebud coal in Area D would have little significant inmpact on groundwater quality in the Cow Creek drainage. Existing reclamation technology and mine water control should minimize impacts to surface water quality to the point that no significant degradation of surface waters reaching Cow Creek would occur.

4/8/81 - DCP

18

The department lacks sufficient data to assess the amount of ground water passing through Area D. The draft EIS points out that other mine areas upgradient of Cow Creek could also add salts to the creek. The same can be said for Area B. An expanded discussion of cumulative impacts is contained in the final EIS.

Salts generally are a product of coal strip mining in the semiarid west (McWhorter and others, 1975). The addition of salts to Cow Creek, above amounts that are expected as result of past and permitted mining, are expected to lower vegetative productivity and agricultural use of land along the creek.

Western Energy Company
SMA #00088
DEIS Comments

Section B, cont'd., Page II - 19, Paragraph 4.

19 COMMENT:

Western Energy questions the relevance of discussing impacts of Montana Power Company's possible siting of a fly ash pond several miles downgradient in the environmental impact statement for mining in Area E. Western Energy has no control over the actions of Montana Power Company and at this time is not able to comment on the possibility of any additional facilities in the Cow Creek drainage.

4/8/81 - DCP

19 Environmental impact statements must address the cumulative impacts of a proposed action, taking into account all existing and possible future sources of pollution. If very saline waters from flyash ponds associated with Montana Power Company's Colstrip units 3 and 4 were to seep into the ground water and eventually reach the surface water of Cow Creek, agricultural uses of Cow Creek downgradient would be severely affected. The draft EIS points out that flyash ponds could have a far more significant effect on the quality of water in Cow Creek than would mining.

DSL realizes that Western Energy has no control over the actions of Montana Power Company. This information was presented to point out what other activities upgradient of Cow Creek will or could add to salt loads of Cow Creek. The discussion of cumulative impacts has been expanded to include existing flyash and other ponds associated with Colstrip generating units 1 and 2.

Western Energy Company
SMA #00088
DEIS Comments

Section B, cont'd., Page II - 20, Paragraph 2.

20 COMMENT:

As discussed in Western's comments, page II - 14, paragraph 2, the existing ponds near the eastern edge of Area E are at or near the water table and water levels are probably maintained by groundwater discharge. Lining these ponds would not prevent seepage because downward seepage probably does not occur. Increased mineralization in the lower ponds is thought to result from evapotranspiration from the pond surfaces. Seepage to the underlying Rosebud-McKay interburden and thin alluvial fill probably occurs primarily in the downstream portions of the excavated channel sections below the ponds. Western does not consider sealing of the ponds to be a viable mitigation technique.

4/8/81 - DCP

20 After reviewing Western Energy Company's comments and newly supplied data, DSL concurs that lining the sediment ponds would not mitigate ground water impacts. (See response to comment A10 for a discussion of the water balance of the ponds.)

Western Energy Company
SMA #00088
OEIS Comments

Section B, cont'd., Page II - 20, Paragraph 4.

21 COMMENT:

Western Energy has obtained access to conduct hydrologic studies immediately to the east of Area E. Investigations will include surface and groundwater monitoring of the headwater ephemeral tributaries of Cow Creek and alluvial and bedrock aquifers. This study will provide additional data necessary for any attempt at assessing impacts of existing mining on the Cow Creek drainage. Information provided by this investigation will be made available to the Department of State Lands on a periodic basis.

4/8/81 - OCP

23

21 Western Energy Company has submitted new information on the quality of ground and spring water, along with stratigraphic logs. This information, included in the final EIS, has been useful in determining the impacts of existing mining on the Cow Creek drainage.

Western Energy Company
SMA #00088
DEIS Comments

Section B, cont'd., Page II - 20, Paragraph - 2.

22 COMMENT:

Selective handling and placement of overburden material into the spoil profile is not a viable mitigating measure. No definition of "saline spoils" is provided; therefore, it can only be assumed that a relatively large volume of material would be considered for selective handling. In a semi-arid regime such as southeastern Montana, the technique, as demonstrated by Dollhopf, has questionable value. Data to date indicate the saturated zone associated with a re-established groundwater system in spoils is only 3 to 5 feet thick in the lowermost part of the profile. Further, evidence indicates recharge and movement of groundwater is horizontal rather than vertical. Thus, the increased mineralization of groundwater seems to be a phenomenon associated with less than five percent of the average spoil profile.

The evapotranspiration rates in the Colstrip vicinity are at least three times the average annual precipitation rate. Therefore, deep percolation of surface moisture simply does not occur. With this information, one would be hard pressed to justify selectively handling and/or capping certain overburden materials in view of the significant costs involved. This technique, as demonstrated by Dollhopf, is not suited to a dragline operation.

4/8/81 - CC

22 DSL questions Western Energy's statement that selective placement is not suited to a dragline operation. Studies of selective placement of overburden (using a dragline) in Area B have proven that saline material can be isolated from ground water and rooting zones.

Data collected on the resaturation of spoils indicates the depth of spoil satuation is quite variable, ranging from 0 to 12 feet. After mining stops and ground water again flows horizontally through the spoils, the saturated thickness of much of the spoils is expected to increase. In addition to the greater saturation thickness, 3 to 6 feet of spoils above the saturation zone will be subject to salt leaching because a capillary fringe zone will extend above to the water level. In total, 10 to 20 feet of spoils could be in contact with ground water; this is considerably more spoils than the 3 to 5 feet identified by Western Energy.

Selective placement of overburden appears to be a viable method of minimizing degradation of ground water. A second method of selective placement of overburden, placing the least saline material at the base of the spoils, has been included in the final EIS. (See chapter II, Hydrology, Mitigation Measures and chapter III, Technological Alternatives.) Placing low-saline spoils in the bottom of the spoil pile would reduce the availability of salts and therefore minimize degradation of ground water passing horizontally through the base of spoils.

See response to comment A16 for further discussion on vertical and horizontal ground water movement.

Western Energy Company
SMA #00088
OEIS Comments

Section D, Air Quality, Page II - 22, Paragraph - 2.

23 COMMENT:

It is stated in this paragraph that Western Energy petitioned the OHES for redesignation of the nonattainment status of the Colstrip vicinity in Oecember 1979. It is further stated that the AQB "determined the application (petition?) was incomplete" and Western Energy is in the process of responding to the deficiency letter."

Both of the latter statements are incorrect. The petition has, in fact, never been acted on by the AQB based on advice of the Attorney General's office to DHES. As a result, no deficiency letter "has ever been prepared and Western is, therefore, not responding to a deficiency letter.

4/8/81 - CC

25

23 The draft EIS is in error. The petition was submitted as stated, but no action has been taken by the Air Quality Bureau. A determination of status must be made by the U.S. Environmental Protection Agency (Hal Robbins, Montana Air Quality Bureau, oral commun., April 15, 1981).

Western Energy Company
SMA #00088
OEIS Comments

Page II -25, Paragraph - 7.

24 COMMENT:

As indicated previously, Western has an approved air quality permit from the DHES. Limitations and conditions were imposed upon Western's Area E mining operations as a part of that permit approval. The permit specifies contouring and shaping the surge pile to minimize wind erosion. The permit also requires complete conveyor cover at all transfer points and the installation of a baffle system at the truck dump to minimize fugitive emissions at the coal handling facility. Baghouses were considered by the AQB to exceed BACT in that the Area E facility was permitted as an existing source. The mitigating measures suggested in this section of the OEIS should be rewritten to be consistent with the approved air quality permit conditions and limitations.

4/8/81 - CC

24 The fact that DHES has issued Western Energy Company an air quality permit does not preclude further examination of air quality impacts in the EIS. While the DHES permit does stipulate measures that must be taken to reduce air quality impacts, impacts could be further reduced with the mitigating measures proposed in the draft EIS (see response A27).

Western Energy Company
SMA #00088
DEIS Comments

Section E, Soils, Page II - 28, Paragraph - 3, Last Sentence.

25 COMMENT:

In order to achieve maximum salvage of the soil resource and insure a growth medium conducive to vegetation re-establishment, Western Energy has agreed to a presalvage soil sampling program in Area E in the permit application. This program involves an intensive sampling of soils that will be disturbed as defined by the post-mine topographic map. Soil samples are taken 0.5 foot deeper than the planned salvage depth. Samples are analyzed to determine texture and soluble salt concentration. Final salvage depth will be adjusted, plus or minus based on these analyses. All soil series listed on page II - 29 of the Draft Environmental Impact Statement will be sampled under this program to determine optimum soil salvage depths. In addition to these series, the Busby-Rock outcrop complex will be sampled whenever the areal extent of the Busby soil is sufficiently large enough to be identified and delineated for soil salvage operations. Western Energy's soil scientist will closely monitor all phases of soil salvage operations to insure maximum recovery of the soil resource.

4/8/81 - JC

25 Comment noted. Thank you.

Western Energy Company
SMA #00088
DEIS Comments

Section G, Wildlife, Page II - 36, Paragraph - 2, Line - 10.

26 COMMENT:

The sandstone will be relocated on regraded areas following topsoil redistribution as shown on the Revegetation and Wildlife Enhancement Facilities Map.

4/10/81 - DS

26 Correction noted. Thank you.

Western Energy Company
SMA #00088
DEIS Comments

Section A. Administrative Alternatives, page III -3, Paragraph - 7 & 8.

27 COMMENT:

The suggested "stipulations" or "mitigating measures" specific to air quality control are excessive in that they exceed the limitations and conditions addressed in the approved air quality permit (No. 1483). This section should be deleted from the FEIS or, as a minimum, rewritten to reflect the requirements of the air quality permit.

4/8/81 - CC

29

27 As stated in response A24, the issuance of an air quality permit does not preclude further study of air quality impacts in an EIS. Additionally, because the Department of State Lands may stipulate in a permit only those controls which improve air quality by reducing wind erosion, some of the air quality stipulations in the DHES permit could not be required by the Department of State Lands (John North, Attorney, Montana Department of State Lands, written commun., May 27, 1981).

Western Energy Company
SMA #00088
DEIS Comments

Page III - 4, Paragraph - 4 & 5.

28 COMMENT:

Reference is again made to Western's application to DHES for an air quality permit. This application was approved on November 26, 1980.

4/8/81 - CC

28 See response A1.

NORTHERN PLAINS RESOURCE COUNCIL

Main Office
419 Stapleton Bldg
Billings, Mt 59101
(406) 248-1154

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P O Box 886
Glendive Mt 59330
406) 365-2525

Ralph Drier
Environmental Coordinator
Montana Department of State Lands
1625 Eleventh Ave.
Helena, Montana 59601

April 11, 1981

RE: Comments on Draft Environmental Impact Statement, Western Energy Company's Rosebud Mine, Area E Extension

Dear Ralph:

Northern Plains Resource Council appreciates this opportunity to comment on the Area E Expansion. In general we agree that the major significant impacts resulting from the Area E Expansion would be hydrologic in nature.

1 Before commenting on hydrologic aspects of this extension, we would like to express our concern with the conclusion that "molybdenosis is not likely to occur because the Cu:Mo ratio in the overburden appears to be high.... (p. II-7 b. Impacts of overburden constituents par. 2). Prior to reaching this sort of conclusion more research is necessary to determine first, the significance of the Cu:Mo ratio, and secondly, the relationship between this ratio found in the soil or overburden and plant tissue.

2 Hydrologic Balance: Section 82-4-231(3)k MCA, requires the mine operator to minimize disturbances to the prevailing hydrologic balance at the mine and in associated offsite areas. There is a scarcity of data in the DEIS on the Area E Expansion indicating that Western Energy Co.'s permit application addresses this issue to the extent intended by law, and therefore the permit should be treated accordingly.

3 Alluvial Valley Floors(AVF): The DEIS states that Cow Creek appears to meet the criteria for an AVF as set forth in the Montana Strip and Underground Mine Reclamation Act. Section 82-4-227(3)b(ii) requires that a permit application affirmatively demonstrate that the mining operation would not materially damage the quantity or quality of waters supplying the AVF. We submit that there is not sufficient enough data available at this time to adequately address this requirement

4 Mitigating Measures: The DEIS mentions several mitigating measures to offset the significant array of hydrologic problems that are facing this area. We strongly support efforts to seal the ponds in a attempt to minimize seepage, and suggest that ground water monitoring stations be placed downgradient to the determine the effectiveness of such seals.

APR 14 1981

1 It is agreed that more research regarding the significance of the Cu:Mo ratio is needed. There is an even greater need for research to determine how the Cu:Mo ratio in soils or overburden is related to the ratio found in plant tissue. Dr. Frank Munshower, Montana Agricultural Experiment Station, Reclamation Research Unit, is currently studying this relationship at Peabody's Big Sky Mine at Colstrip.

The statement on page II-7b, para. 2 of the draft EIS is based on the findings of Dollahite and others (1972), Kubota (1975), and Erdman and others (1978).

The occurrence of molybdenosis in southeastern Montana appears to be rare; please see DSL's response to Letter E for further discussion of molybdenosis.

2 DSL has not yet determined whether Western Energy's mine plan complies with this section of the Montana Strip and Underground Mine Reclamation Act. This determination will be made before a permit is issued. For information on impacts on off-site areas see responses A13 and C1.

3 The department agrees with Northern Plains that there is not sufficient data available to assess whether or not Cow Creek is an alluvial valley floor.

Based on the available information, the cumulative impacts of all anticipated mining at the Rosebud mine could degrade the surface water quality of Cow Creek enough to lower vegetative productivity of land downstream. The question of whether or not Cow Creek is an alluvial valley floor may be a moot point because protection of the important hydrologic characteristics of Cow Creek is assured by section 82-4-227(3)k MCA, which prohibits material damage to the hydrologic balance of off-site areas.

4 The ponds probably are fed by ground water. Sealing the ponds would not prevent degraded spoils water from moving downgradient and into off-site waters. See Western Energy's comment A10 and DSL's response.

p. 2. NPRC's comments on WECo's Area E Expansion

5 We are deeply concerned with the effect of ground water contamination. The contamination of groundwater by saline spoils would further exacerbate an existing problem, and measures such as selective burial of spoils should be utilized to prevent this contamination.

6 In Conclusion: 82-4-227(3) MCA requires that the Montana Department of State Lands not approve a mining permit unless they make an assessment of the probable cumulative impact of all anticipated mining in the area on the hydrologic balance. The available hydrologic information tends to support the conclusion that the expansion of Area E would add to existing problems, and that Western Energy has not submitted, nor does the Department of State Lands have available enough information to make a cumulative impact assessment as required by existing regulations.

Respectfully submitted,

Russ Brown

Russ Brown
NPRC Staff

5 DSL knows of no feasible way to prevent degraded ground water from seeping from existing mine spoils into off-site waterways. Selective placement of overburden may be a feasible mitigation measure for new mine areas in Area E and Area B.

6 It is correct that 82-4-227(3) MCA requires a cumulative assessment of hydrologic impacts. This assessment is more clearly defined in the final EIS.

April 10, 1981
Friday

Mr. Ralph Driear
Department of State Lands
Capitol Station
1625 11th Ave.
Helena, Mt. 59601

R.E. The Draft Environmental Impact Statement of Western Energy Company's proposed Area E expansion

1 This particular draft EIS is the only one to adequately address the traumatic, lasting, adverse hydrological impacts possible as a result of coal strip mining. Because the information recorded in this document clearly indicates vast irrevocable damage will result from strip mining compared to the minimal, short term advantages to the project, the permit application for expansion should be denied!

2 The EIS states the "predominant aquifers are the Rosebud and McKay coal seams". If the Rosebud acquifer is removed what conclusive proof is there to indicate the groundwater stream will re-establish itself? Furthermore, how can an underground stream re-establish itself in view of the fact that the "overburden" replacing the aquifer material during 'reclamation' is composed largely of clay, a non-absorbant sealant?

3 Not only will there be water damage "for centuries" as the EIS states, there already has been an extreme amount of on-site and off-site damage as a result of present mining activities. Reclamation has yet to be proven successful in the thirteen years since mining re-
4 commenced in the area! Off-site (downstream) damage can also be considered irreversible.

5 Cow Creek, prior to 1970 was an intermittent stream bordered by native meadowland with abundant native grasses and lined by numerous trees. Now the creek bed contains huge amounts of water most of the time, sometimes it flows the entire length and other times it has large pockets of water stagnating on the lower surfaces. Many areas are engulfed with swamp-like conditions cat tails, swamp grass, marshy soil, salinity, and a 'rotten egg' smell. In addition most of the trees are dying because their roots are water-logged or poisoned.

6 The water itself is all but useless. Stock cattle and horses do not like the water. I have seen Cow Creek in recent years contain a deep rust red water and in some spots be very foamy. Water tests done in the past few years by the USGS show abnormal amounts of minerals and some poisons in the water. All in all, Cow Creek is no longer a healthy, productive area.

1 Mine spoils from the Area E extension would add salts to Cow Creek, potentially reducing vegetative productivity along the creek for hundreds to thousands of years. (See Summary, Relationship between Short Term Uses of the Environment and Long Term Productivity.)

The use of mitigation measures identified in chapter III, Technological Alternatives, could reduce the hydrologic impacts on off-site areas.

2 A study of the ability of mine spoils in the Northern Powder River Basin to act as aquifers showed that ground water moved more slowly through spoils with high amounts of clay and/or silt than it moved through coal aquifers. Ground water moved more rapidly through spoils containing appreciable amounts of sand and/or gravel than it did through the coal aquifers (Rehm and others, 1980).

Pump tests done on spoils at Colstrip indicate that the spoils generally are better conveyors of ground water than the coal seams they replace. This may not be true for the entire mine area, but because overburden in Area E has substantial amounts of sandstone, ground water should flow through the spoils as readily as it did through the Rosebud aquifer.

After reclamation, the amount of ground water flowing through Area E probably will not be reduced; however, the quality of water will be reduced.

3 Ground water is degraded very near the existing mine site, and two small tributaries to Cow Creek may have degraded shallow alluvial ground water. Off-site water quality degradation resulting from mining is not considered significant as yet because uses along Cow Creek have not been adversely affected by the existing mine spoils. However, the potential for future damage is significant. (See revised text, chapter II, Hydrology, Description of the Existing Environment, Current Mining Impacts, and Impacts of the Proposal.)

4 While bond has not yet been released for any of the coal mines in this area, this does not necessarily mean that reclamation is not proving successful in a number of areas. Peabody Coal Company and Decker Coal Company have reclaimed areas that are doing quite well. Western Energy Company's Area A has a good, diverse vegetative cover which will increase the likelihood of successful reclamation.

However, DSL requires a minimum bonding period of 10 years after initial seed planting. All of the companies mentioned above are still within this 10-year period, so bond cannot be released. DSL also has the option of extending the bonding period for a particular area, depending on the status of the reclamation. A bonding period of at least 10 years is necessary to ensure that: (1) adequate vegetative cover and diversity of species are attained, (2) the vegetation is capable of reproducing itself, and (3) vegetation is able to withstand grazing pressure.

7 The dsgradation of the arsa has been a reeult of on-going mining activitiss in Area E. Seepage or dumping from holding ponde adjacent to ths mining at the head of the Cow Creek drainage ie the cauee of ths advsrss impacts. Privats citizens havs, up to thie time, been forced to absorb the damage. Many new, deepsr domestic and stock wells havs bssn drilled to rsplace ruined goundwater and much of the pasturesland has besn rendered useless due to marehy conditions and salinity.

8 This type of waste cannot be allowed to continue at the expsnse of futurs generations who will need the land and watsr to survivs, to saynothing of the survival of present gsnerations! Ws need the land (and the produce from it) and the watsr more than we need the coal to ssrve as a "quick fix" to keep warm! Instead of endorsing the continued 'boom and bust ravaging' of south-eastern Montana why not for the first time in the history of the DSL catagorically deny a coal mining permit application and in so doing prove to the citizenry the DSL really does care about the 'etate lande'?

Sincerely,

Thomas J. Johnson Colleen K. Johnson

Thomas J.& Collsen K. Johnson
P.O, Box 103
Worden, Montana 59088

5 Without documented flow information for Cow Creek prior to 1970, past and present flows cannot be compared. The increased water table of Cow Creek probably has resulted from increased precipitation in south-eastern Montana in the early 1970s. Similar elevated water tables have recently appeared in other streams and springs which clearly have not been affected by mining in the area. The available information indicates that mining upstream has had little to do with the increased water table down-stream, and may have slightly reduced the baseflow in Cow Creek by inter-cepting ground water normally discharged to the creek.

6 It would appear from the new information supplied to DSL that the poor quality water in lower Cow Creek is not the result of mining at Western Energy's mine. The reported (but undocumented) increase in salts in Cow Creek could be due to the increased precipitation of the early 1970s or to flood irrigation of fields along Cow Creek. In either case, as a result of excess amounts of water upstream, salts have been leached from soil, entered the shallow ground water, and resurfaced downstream, forming a saline crust.

7 Seepage and pumping from the sedimentation ponds have not been major sources of salts in the lower Cow Creek drainage. The amount of water presently seeping through mine spoils is quite small. Pumping of pond water into Cow Creek has occured only occasionally, if at all, and could not appreciahly change the water quality several miles downstream in Cow Creek because the pond water would be diluted by water from other sources. As mentioned above, other factors are probably the cause of increased salts in Cow Creek.

8 While DSL has not denied a coal mine permit outright, it has required several mining companies to substantially modify their permit applications in order to avoid serious environmental problems (the Spring Creek mine is an example). (See response C1.)

LETTER D

Forsyth, Montana
April 10, 1981

Mr. Ralph Driear
Environmental Administrator
State Department of Lands
Capital Station
Helena, Montana 59601

RE:
AREA E EXTENSION
ROSEBUD MINE, COLSTRIP, MONT.

Dear Sir:

The Department of State Lands is to be commended for the candid approach to the HYDROLOGY problem relative to the proposed MINE EXTENSION in AREA E, at the Rosebud mine, operated by Western Energy Company, at Colstrip, in Rosebud County, Montana.

Re: SUMMARY - Item3. Summary of Impacts by discipline:
Hydrology - impacts could be significant, because continued mining could add additional saline waters to the headwaters of Cow Creek. This could slightly reduce the productivity of irrigated fields and native rangeland east of Area E.

1 The staff of the Dept. of State Lands is already very aware of the severe degradation which has occurred on North Cow Creek, the result of coal stripmining, and both illegal and permitted discharge of mine waters into the tributaries of that drainage, as is the offending Company.

During earlier operations of mining in Area E, no such candid report was presented regarding the presence of noxious chemicals and minerals in the soil, those which would find their way down the drainages of Cow Creek and Armells creek disguised as "run-off water," but which were predominently carried by an abundance of groundwater in the Rosebud vein. The Mining Company maintained they had "no problem with groundwater in the mine," and they didn't. This was because they pumped, and are continuing to pump saline waters on to that property of their downstream neighbors. Wearing a facade of "goodi-2-mouths," they have held those property owners who made vocal complaint in a position of being witless and ignorant. It is time their deception was exposed.

1 New water quality samples taken from wells and springs east of Area E within the headwaters of Cow Creek indicate that ground water immediately adjacent to the old mine spoils has been degraded and that shallow ground water within the alluvium of two tributaries to Cow Creek may have been degraded by seepage of mine spoils. Nevertheless, data collected on Cow Creek indicate that mining has not yet degraded water quality enough to adversely affect agricultural uses downstream.

When mining in Area E stops and the ground water again flows eastward, spoils water could adversely affect the quality of surface water in Cow Creek and cause reductions in vegetative productivity along the creek. (See revised text, chapter II, Hydrology, Current Mining Impacts and Impacts of the Proposal.)

Page II-9, the second paragraph reads: "Cow Creek could be more affected by mining in Area E than E. F. Armells creek for the following reasons: 1) approximately two-thirds of the area to be mined drains into Cow Creek; 2) the drainage area of Cow Creek and So. Fork of Cow Creek is about half that of East Fork Armells Creek and therefore the mine area constitutes a greater percentage of its drainage area; 3) groundwater in the bedrock units below the level of mining--the Rosebud-McKay interburden and the McKay coal seam--flows to the east, towards Cow Creek. Because of this, the ensuing discussion emphasizes the Cow Creek drainage.

2 The fact is, the North fork of Cow Creek was already severely impacted by the illegal discharge of mine water in to its tributaries before any base data was obtained, and the same circumstances pertain to the E. F. of Armells Creek. Continued discharge of mine water has already severely degraded the Alluvial Valley Floor of both creeks. To date, Western Energy Company, as well as the enforcement officials of State and Federal Government, have evaded confrontation with the issue of excess water from the mines, and the creep-salinity it has created on those two drainages. It is time this problem was addressed, and it is time the offending Company was made responsible. It is time Western Energy Co. is held reponsible for degradation it has already incurred to another's property, and it is time that Company was forced to stop the act of degradation.

3 We are grateful to the State Land Department for the report of the high content of Molybdenum in the soils of the proposed mine area. Undoubtedly, that mineral was present in other parts of the area which has been mined, but it's presence in the water flowing down Cow Creek has not been subjected to test. It is possible, but perhaps can never be proven, that the presence of Molybdenum was the cause of a 25% death loss in calves during the spring of 1979, among cattle running at the head of No. Cow Creek. In our own herd, having access to the waters of Cow Creek, we had a greater than average death loss. One wonders, is that one of the dubious pleasures of owning land adjacent to a strip-mine operation?

2 DSL does not believe that mining is the cause of salinity problems in the Cow Creek drainage. Several other factors, such as increased precipitation in the early 1970s and the presence of spreader dikes that flood irrigate fields above your property, are possible causes of increased salinity downstream. Cow Creek is a small drainage that appears to have naturally high amounts of salts, especially in its lower reaches. (See chapter II, Hydrology, Description of the Existing Environment.)

Impacts to East Fork Armells Creek are discussed in the EIS for Area B, sections 4, 9, and 10. Mining in Area E will not affect East Fork Armells Creek because ground water generally will flow from west to east through the Area E mine spoils, thus affecting drainages to the east rather than towards East Fork Armells Creek.

3 See response to Letter E.

4 The degradation of water coming from the mine spoils is clearly documented, (p.II-16) pertaining to the two drainages of Cow Creek. This documentation should be ample reason for the Department of State Lands to refuse the proposal for extension of mining in Area E. A further study, one undertaken by an unbiased agency should be completed before any consideration is given to the Area E expansion. The studies should include the entire gamut of minerals and chemicals which could adversely affect downstream property owners, including those downstream on Rosebud creek. While the expansion would mine coal approximately four (4) years, with a lucrative pay return to the mining Company, the State coffers, and Federal coffers, continued destruction to the property of those off site for a very much longer duration should be a large part of the consideration..

5 P. II 19 reports the scheduled building of a "fly ash" pond for plants 3 and 4 at the headwaters of Cow Creek. The Company could have selected a no less desirable location for a "fly-ash" pond than that chosen. It is the most highly permeable soil structure in the entire mine area. We believe the site was selected with malice aforethought. Knowing they had already caused irreparable harm to property owners east of their digs, they chose to construct a method of "coup de grace" for the more vocal of their opponants. <u>There is no mitigating measure for this atrocity</u>.

6 Looking to the future, it is possible that some good water could find it's way along the subsoil of the alluvial valley of E. F. Armells creek, beneath that covered by the State Highway, and on through the Area E. expansion, so that those property owners who stand to lose <u>all</u> of the groundwater as a result of mining, might not suffer quite such devastating affect. There is that slim margin of chance, and I ask that it be considered on equal terms with the short term coal income. After all, we were here before mining, and would like to remain after mining has ceased.

Thank you for the opportunity to critique this E.I.S. There were other subjects which are important, but none, absolutely nothing is as important as Wydrology, a subject which has never been properly addressed in relation to the

4 **The discussion on page II-16 of the draft EIS incorrectly implied that mining was the cause of high TDS levels reported in Cow Creek. This is not the case, and the final text has been revised accordingly.**

Salinity problems in Cow Creek resulting from mining in Area E probably will not occur until decades after mining stops and the area is reclaimed.

The short-term benefits of mining coal should be weighed against the long-term use of both on and off-site areas. This issue is addressed in greater detail in the final EIS.

5 **The draft EIS stated that seepage may occur at a rate of 104 gpm; however, the Department of Natural Resources will probably require mitigation measures that would reduce seepage and thus minimize hydrologic impacts (Gail Kuntz, oral commun., June 1980). For more information on the flyash ponds, you may contact the Department of Natural Resources, Facility Siting Division. DSL has no permitting authority on this matter; the information was presented to point out the possible cumulative impacts.**

6 If your concern is changes in the amount of groundwater: the amount of ground water and surface water that will reach Cow Creek when mining stops and the area is reclaimed should be similar to the amount reaching the creek before mining began. If your concern is ground water quality: see responses A13, A15, and C1. The final EIS discusses more fully the short-term gains of coal mining versus the long-term hydrologic impacts of mining on agriculture.

coal stripmining of the west. The Dept. of State lands has endeavored to address the issue in this EIS. Hopefully they will weigh the final decision with equal concern.

Most Sincerely,

Patty Kluver

Patty Kluver, Sec. Treas.
Genie Land Co. owner of property
east of the proposed expansion

7 P. S. Are you aware that, in addition to the mine expansion of Area E, proposed by Western Energy Company, and the location of an Ash Pond at the headwaters of no. Cow Creek, they have leased an area northeast of Colstrip, with a groundwater aquifer flowing four (4) ft. beneath the surface of the area, in some early day spoils, for a waste disposal dump ground. A two county operation, it, too, will adversely affect the groundwater of Cow Creek and the drainage to the north known as Pony creek.

It should be called to the attention of all officials that both the Ash pond and the Dump site are down syncline from Colstrip. This further substantiates my accusation that motive is a part of the desire for further expansion of Area E..

7 We are aware of the waste disposal site and have met with personnel at the Solid Waste Management Bureau of the Department of Health and Environmental Sciences about the landfill (meeting with Duane Robertson, January 1981). Surface water percolating downward or ground water moving laterally could pick up contaminants and pollute off-site waters. In January, plans indicated that the waste dump would have a clay liner on the bottom only. If the clay liner were extended up the sides of the dump, horizontal movement of ground water through the wastes could be prevented. Please contact the Solid Waste Bureau for more up-to-date information.

LETTER E

Forsyth, Montana
April 10, 1981

Mr. Ralph Driear
Environmental Administrator
Dept. of State Lands
32 So. Ewing
Helena, Montana 59620

Dear Mr. Driear:

In haste to send a critique of the AREA E extension proposed by Western Energy Company, I overlooked an important item. This letter is in addition to the one mailed to you yesterday.

In the spring of 1979, following the heavy snow fall of that winter, and the heavy run-off, a man employed by Mont. State University was here in behalf of his Reclamation studies, conducted for Western Energy Company..

At that time he told me, "You have a very low copper count ratio in this area, and you should be feeding some mineral to off-set it."

I believe that man knew of the presence of Molybdenum in the Reclamation in Area E. With the heavy run-off, he knew it would affect the livestock down stream from Area E. Without revealing the serious consequences of Molybdenum, (due to his employment) the gentleman was trying to warn me.

His warning came too late! Both our neighbor who'se land joins Area E on the east, and our ranch operation suffered considerable loss due to "weak calf syndrome." Since we aren't Scientists, we thought it was something we were doing wrong. Now, we learn it could very well have been the Molybdenum in the heavy run-off from the reclamation in Area E which caused both ranchers with holdings on Cow Creek to have an unusual death loss among our calves. Hindsight is sometimes very revealing, isn't it?

Sincerely,

Patty Kluver

Patty Kluver

DSL agrees that molybdenum, if present in relatively high amounts, could cause copper deficiency problems in livestock. However, analyses of soils and overburden in southeastern Montana for molybdenum show low concentrations of this element in most cases. Even if the molybdenum concentrations are high, molybdenosis usually can be treated and rarely causes death. Five veterinarians in southeastern Montana were asked about the frequency of occurence of molybdenosis in cattle; their responses were as follows:

-Dr. Baber, Custer Veterinary Clinic, Miles City -- In 12 years of practice, no cases of molybdenosis were diagnosed.

-Dr. Forsberg, Yellowstone Valley Veterinary Clinic, Forsyth -- In 17 years of practice, no cases of molybdenosis were diagnosed.

-Dr. Smith, Miles City Veterinary Service, Miles City -- In 10 years of practice, no cases of molybdenosis were diagnosed.

-Dr. Stoddard, Powder River Veterinary Clinic, Broadus -- In 12 years of practice, he diagnosed only 5 cases of molybdenosis.

-Dr. Van Zandt, Valley Veterinary Service, Hardin -- In 17 years of practice, 2 cases of molybdenosis were diagnosed, one near Lewistown (Fergus County) and the other near Ingomar (Rosebud County).

In their 68 years of combined experience these five doctors have diagnosed only 7 cases of molybdenosis in southeastern Montana. Considering the tens of thousands of head of cattle in the region, it can be safely assumed that this is not a common disease in the area.

A survey of the above-mentioned veterinarians, county extension agents, and ASCS and SCS personnel in southeastern Montana showed that the addition of copper to mineral supplements is not a common practice in the area. The veterinarians contacted have not specifically recommended copper supplements to offset the possibility of molybdenosis.

The "weak calf syndrome" referred to in Mrs. Kluver's letter is not related to molybdenum. According to Drs. Stoddard and Forsberg, classic "weak calf syndrome" is generally attributed to a selenium deficiency. In western Montana this may hold true, but in eastern Montana what is often termed "weak calf syndrome" is usually diagnosed as PI3 Virus (Para Influenza), BVD (Bovine Virus Diarrhea), or Red-Nose Virus. These 3 diseases do cause death among calves.

Little research has been done on the presence of molybdenum in runoff water. However, Dr. Frank Munshower of Montana State University is conducting research on the relationship between the amount of molybdenum in soil and the amount in plants at the Big Sky Mine near Colstrip. According to Dr. Munshower, molybdenum is soluble in water at alkaline pH values--usually those above pH 8. Since molybdenum values in the soils and overburden at Colstrip are relatively low, and since these low values would be diluted even more in surface water (assuming the pH of the water was 8 or greater), it is doubtful that any molybdenum contained in the runoff water would present a problem.

University of Montana
Missoula, Montana 59812
School of Forestry
March 23, 1981

MAR 30 1981

Ralph Driear
Montana Dept. of State Lands
Capitol Station
Helena, Montana 59620

Dear Sir:

I am writing concerning the draft of Western Energy's Rosebud Mine - Area E Extension - Environmental Impact Statement. I have been studying soils and vegetation in respect to reclamation. I will comment on 11-31, item 4, Mitigating Measures. In this statement some rock from the Cabbart and Yawdim soils will apparently be included in the salvaged soil. I feel that this is a good idea, as long as the stone is not heavily calcareous. Our studies so far suggest that some rock in the soil, especially near the surface, will aid water retention and growth.

The third paragraph on 11-34 sounds reasonable as a measure of holding the soil until trees can be established. For trees, I would recommend a land contour to minimize the extent of south-facing slopes. If these soils are as sandy as they appear to be trees establishment should not be a problem.

I would like to see chemical and physical data on these soils.

Sincerely,

N. Stark

N. Stark, Ph.D.

NMS/mbk

Equal Opportunity in Education and Employment

This comment was discussed with Dr. Stark by telephone. After being informed that the material underlying the Cabbart soils consists of soft shales, siltstone, or sandstone and that the material underlying the Yawdim soils consists of calcareous shale, Dr. Stark agreed that these materials probably should not be included with the salvaged soil.

Dr. Stark's recommendation regarding tree establishment is appreciated and will be considered.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Billings Area Office
Federal Building, Room 3035
316 North 26th Street
Billings, Montana 59101

IN REPLY REFER TO:

ES

April 3, 1981

Mr. Gareth Moon, Commissioner
Montana Department of State Lands
Capitol Station
1625 Eleventh Avenue
Helena, Montana 59601

Dear Mr. Moon:

We have reviewed the draft environmental impact statement on Western Energy Company's proposed extension of mining in Area E, Rosebud Mine, Colstrip, Montana. We believe the statement adequately addresses impacts to fish and wildlife resources that will occur from the mining extension in Area E.

Gobblers Knob, a prominent land feature within Area E, will not be affected by this action and subsequently was not addressed in this OEIS. We understand however, that the Gobblers Knob area was included in an earlier permitting procedure and is covered by an existing mine and reclamation plan. This existing reclamation plan calls for reclamation of mine cuts to five to one slopes. We believe that if properly designed, some high wall retention on Gobblers Knob could result in an area with significantly higher values for several raptor species.

Western Energy is currently considering an alternative to the existing reclamation plan which would include some features of additional value to raptors. We are very interested in Western Energy's proposed reclamation plans for this area and are currently evaluating their proposal. If an alternative for reclamation of Gobblers Knob is developed, we would appreciate the opportunity to review and comment on the revised plan and/or EIS.

Sincerely,

Jack O. Larmoyeux
Acting Area Manager

cc: Regional Director, USFWS, Denver, CO (ENV)
Director, Montana Department of Fish, Wildlife & Parks
Helena, MT
Regional Director, OSM, Denver, CO
Mr. Bill Schwarzkoph, Western Energy Company, Colstrip, MT

Thank you for your comment. Highwall retention appears to be a good management technique for some raptor species, and several agencies have expressed support for implementing the technique. We will consider highwall retention when we examine Western Energy Company's alternative reclamation plan, which was not received in time to be reviewed prior to completion of the final EIS.

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
ENVIRONMENTAL SCIENCES DIVISION

TED SCHWINDEN GOVERNOR — COGSWELL BUILDING

STATE OF MONTANA

(406)449-3946 — HELENA, MONTANA 59620

April 8, 1981

Ralph Driear
Environmental Administrator
Department of State Lands
Capitol Station
Helena, MT 59601

Dear Ralph:

The Air and Water Quality Bureaus reviewed the draft environmental impact statement on Western Energy Company's proposed extension of mining in Area E of its Rosebud Mine, and Fred Shewman from the Water Quality Bureau had the following comments:

> I would dispute part of the statement at the top of page II-13 that identifies probable causes of decreased water quality in Armells Creek. First, the power generating units do not discharge, and secondly, the generating units, sewage treatment plant and the lawns in the community all receive imported water from the Yellowstone River, which is of much better quality than the water in Armells Creek.

Thank you for an opportunity to comment.

Sincerely,

Thomas M. Ellerhoff
Technical Writer

jg

cc: D. Willems
F. Shewman

RECEIVED
APR 10 1981
STATE LANDS

Thank you for pointing out the errors in and vagueness of the discussion on man-caused pollution sources of East Fork Armells Creek. The sources of pollution are more clearly defined in the final EIS.

As you point out, power units 1 and 2 at Colstrip do not discharge pollutants directly; however, flyash and other industrial ponds that are part of the generating facilities have been identified as sources of shallow ground water degradation. The poor quality water that seeps out of these ponds and into the ground water most likely reaches East Fork Armells Creek.

Although the quality of Yellowstone River water is good when it arrives at Colstrip, some of the uses of that water may lower its quality. Residential and industrial uses add salts to the water, which is discharged from the sewage treatment plant. The river water also is used to irrigate lawns, and in this process salts can be leached from underlying soils. Natural sources of pollution may also be responsible for reduced water quality.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of the
Principal Regional Official

Region VIII
Federal Office Building
1961 Stout Street
Denver CO 80294

April 14, 1981

Mr. Ralpb Driear
Environmental Administrator
Department of State Lande
1625 - 11th Ave.
Helena, Montana 59601

Deer Mr. Driear:

We have reviewed your draft environmental impact statement on Western Energy Company's proposed extension of mining in Area E of its Rosebud mine near Colstrip, Montana, and have the following comments:

1. The statement seems to cover most of the major environmental impacts. Several of the major problems identified include; shortage of physicians, underetaffed mental heath services and significant air and noise polution. We would like to request additional information on what steps will be teken to alleviate medical shortages and to comply with environmental standards.

2. The preliminary analysis indicates that welfare services can be adequately handled by existing staff. We have no basis for challenging this conclusion, and neither does the Montane Department of Social and Rehabilitation Servicee.

   The Montana Department of Social and Rehabilitetion Services has expressed interest in being included as e participating state agency as environmental impact statements are developed. It would be eppreciated if you would include them on your list.

Sincerely yours,

J. W. McIntire, P. E.
Acting Director, ROFEC

1 Montana's Department of Health and Environmental Sciences is the state agency responsible for the state health plan. Your requeet for additional information has been forwarded to that agency.

2 Thank you for your comment.

3 The Montana Department of Social and Rehabilitation Services will be included as a participating etate agency as future environmental impact statements are developed.

DEPARTMENT OF THE ARMY
OMAHA DISTRICT CORPS OF ENGINEERS
6014 U S POST OFFICE AND COURTHOUSE
OMAHA NEBRASKA 68102

REPLY TO
ATTENTION OF

RECEIVED
APR 3 1981
STATE LANDS

MRDPD-A

30 March 1981

Mr. Ralph Driear, Environmental Administrator
Department of State Lands
1625 Eleventh Avenue
Helena, MT 59601

Dear Mr. Driear:

We have reviewed the Draft Environmental Impact Statement for the proposed expansion of mining in Rosebud Mine near Colstrip, Montana, and offer the following comment.

The proposed expansion of mining operations will not come under the purview of Section 404 of the Clean Water Act and will, therefore, require no action on the part of the Corps of Engineers.

Thank you for keeping us informed.

Sincerely,

DAVID L. THOMSEN
Chief, Planning Division

Thank you for your review.

ECON
ECOLOGICAL CONSULTING SERVICE

ECON INC.
1300 Cedar Street
Helena, Montana 59601
Telephone
406/442-4650

March 13, 1981

Mr. Ralph Driear
Environmental Administrator
Montana Department of State Lands
1625 Eleventh Avenue
Helena, Montana 59601

Dear Ralph:

I have reviewed the sections of the Area E Extension, Western Energy Company, draft environmental impact statement concerning vegetation and wildlife.

The older reclamation in the Colstrip area is showing considerable diversity. In the past several years, there has been a very observable increase in the use of reclaimed areas by wildlife. One such activity is nesting and brood rearing by sharp-tailed grouse. Another is by mule deer does who often hide their fawns in it while feeding.

The draft EIS is correct, from all evidence to date, in assuming the Area E Extension will not be a threat to either vegetation or wildlife.

Sincerely,

Robert E. Carroll
Vice-President and General Manager

REC/jw

Thank you for your comments on the draft EIS. DSL does not believe the Area E Extension would threaten wildlife or vegetation in the area. However, frequency of wildlife use of the area has not been well documented.

Western Energy Company's 1980 Annual Wildlife Report on the Rosebud Mine indicated that 85 reclaimed acres in Area A and 100 reclaimed acres in Pit 6 were not used extensively by sharp-tailed grouse for nesting. Additionally, according to Western Energy biologists, no mule deer fawns were seen in these reclaimed areas in 1980.

Continued studies of reclaimed areas will provide the documentation that is needed to make conclusive statements about the importance of reclaimed habitat to different species.

CHAPTER V

APPENDIXES

APPENDIX B-1.--Rosebud mine spoil water quality

Location	TDS mg/l	Age of Spoils (years)	Well No.	No. of Well Samples
NE Corner Area E	5,455	55	W-2	2
NE Corner Area E	2,630	55	W-3	1
NE Corner Area E	2,720	55	W-4	6
NE Corner Area E	3,680	55	W-5	1
SE Corner Area E	3,533	55	S-09	1
SE Corner Area E	3,959	55	S-10	1
SE Corner Area E	4,009	55	S-07	1
Average:	3,712			
Pit 6	2,785	22	S-1	17
Pit 6	2,120	22	S-2	17
Pit 6	1,158	12	EPA-3	2
Pit 6	2,225	12	EPA-10	1
Pit 6	1,097	12	EPA-12	1
Average:	1,877			
Area A	2,875	3-5	WS-106	2
Average:	2,875			
Area B	3,840	2-3	CR-2	11
	1,947		D-2	3
Average:	2,894			
TOTAL MEAN AVERAGE:	2,936			
TOTAL MEDIAN AVERAGE:	2,753			

APPENDIX B-2.--Shallow alluvial ground water quality of Cow Creek and South Fork Cow Creek (downgradient of Area E) and comparable streams not affected by mining

I. Wells potentially affected by seepage of mine spoil water into alluvial ground water.

Location	Alluvium Ground Water Quality (TDS) mg/l	Well No.	Source	No. of Samples
Cow Creek				
-Tributary to	4,340	WA-135	WECo Data Files	1
-Tributary to	3,930	WA-133	WECo Data Files	1
South Fork Cow Creek				
-Adjacent to Area E	5,265	S-05	VanVoast & others, 1977	7

II. Alluvial wells from nearby creeks that are not affected by mine spoil seepage.

Location	Alluvium Ground Water Quality (TDS) mg/l	Well No.	Source	No. of Samples
Emile Coulee				
-2 miles south of Area E	2,340	BS-11	VanVoast & others, 1977	1
	2,090	BS-12	VanVoast & others, 1977	1
	2,960	BS-13	VanVoast & others, 1977	1
	3,290	BS-14	VanVoast & others, 1977	1
	2,209	13	Dollhopf & others, 1979a	8
	1,796	27	Dollhopf & others, 1979a	7
Average	2,154			
Pony Creek				
-3 miles north of Area E	1,860	WA-112	WECo data file	1

APPENDIX B-3.--Rosebud coal seam water quality (samples taken upgradient west of Area E)

Mine area	TDS mg/l	Source	Location	Well No.	No. of well samples
B	820	Van Voast & others, 1977	1N41E 16 BAA	S-19	2
B	2,297	"	1N41E 18 ADDC	S-21	3
B	1,970	"	1N41E 10 ADA	S-28	5
B	1,905	"	1N41E 10 AACD	2-28	15
B	820	"	1N41E 16 BAB	S-19	2
B	1,301	Dollhopf & others, 1977	1N41E 3 CBB	4-R	1
B	2,466	"	1N41E CBD	5-R	1
B	857	"	1N41E CAD	28-R	1
B	636	"	1N41E DCDB	29-R	1
B	668	"	1N41E 10 AABB	30-R	18
B	2,077	"	1N41E 4 DDDD	31-R	15
B	1,245	"	1N41E 10 ABB	33-R	1
B	1,935	"	1N41E 3 CBD	34-R	1
B	836	WECo data file	1N41E 11 BB	10-R	12
E	1,660	"	2N41E 34 DDB	12-R	1
B	1,405	"	1N41E 10 BD	15-R	14
B	1,085	"	1N41E 4 CDB	41-R	10
B	671	"	1N41E 9 BBD	42-R	8
B	652	"	1N41E 9 BCC	WR-101	3
B	1,135	"	1N41E 7 AD	WR-102	2
D	1,990	"	2N41E 27 ADC	WR-107	1
West of E	4,606	"	1N41E 11 DAA	WR-108	3
MEAN AVE.:	1,547				
MEDIAN AVE.:	1,353				
RANGE:	636 to 4606				

APPENDIX B-4.--McKay coal seam water quality

I. Wells Upgradient of Area E

Location	TDS mg/l	Source	Well No.	No. of well samples
Area A	2,050	WECo Data File	P-06	1
Area B under pit	1,170	"	CM-1	10
Area B	2,288	"	15-M	14
Area B	2,086	"	31-M	14
Area B	1,752	"	43-M	8
Area B	758	"	41-M	8
Area B	714	"	42-M	7
Area B	1,510	"	WM-102	2
Area A	1,845	"	WM-103	2
Area B	721	"	WM-106	2
Mean Average:	1,490			
Median Average:	1,631			
Range:	714 to 2,288			

II. Wells Degraded by Mine Spoil Seepage

Location	TDS mg/l	Source	Well No.	No. of well samples
SE Area E	3,192	WECo Data File	S-08	5
SE Pit 6	6,134	"	S-04*	13
SE Area E	7,490	"	WM-127	1

*In 1973-74 well S-04 had good water quality (average: 1,250 mg/l), but since 1975 water quality has been very poor.

APPENDIX F-1.--Seed mixtures proposed for Area E

LOWLAND/DRAINAGE MIXTURE

Common Name	Scientific Name	% Total Mix (PLS)*
Rosana western wheatgrass	Agropyron smithii	30
Slender wheatgrass	Agropyron trachycaulum	20
Thickspike wheatgrass	Agropyron dasystachyum	10
Mountain brome	Bromus marginatus	10
Kentucky bluegrass	Poa pratensis	10
Canada bluegrass	Poa compressa	10
Canada wildrye	Elymus canadensis	10

UPLAND MIXTURE

Common Name	Scientific Name	% Total Mix (PLS)*
Rosana western wheatgrass	Agropyron smithii	30
Critana thickspike wheatgrass	Agropyron dasystachyum	20
Green needlegrass	Stipa viridula	20
Slender wheatgrass	Agropyron trachycaulum	10
Prairie sandreed	Calamovilfa longifolia	10
Side-oats grama	Bouteloua curtipendula	10

STEEP UPLAND MIXTURE

Common Name	Scientific Name	% Total Mix (PLS)*
Rosana western wheatgrass	Agropyron smithii	25
Green needlegrass	Stipa viridula	25
Side-oats grama	Bouteloua curtipendula	15
Bluebunch wheatgrass	Agropyron spicatum	15
Thickspike wheatgrass	Agropyron dasystachyum	10
Prairie sandreed	Calamovilfa longifolia	10

*Total mix pure live seed (PLS) will be based on the number of seeds per pound of each species. Seeding rates will be 20 lbs/acre PLS. Winter-graze will be planted at 5-10 lbs/acre PLS.

SUPPLEMENTAL MIXTURE

[Used in conjunction with each of the three range mixtures]

Common Name	Scientific Name	% Total Mix (PLS)*
Needleandthread	Stipa comata	20
Indian ricegrass	Oryzopsis hymenoides	20
Big bluestem	Andropogon gerardi	10
Sand bluestem	Andropogon hallii	10
Little bluestem	Schizachyrium scoparium	5
Fourwing saltbush	Atriplex canescens	5
Winterfat	Ceratoides lanata	5
Blue grama	Bouteloua gracilis	5
Lewis flax	Linum lewisii	5
Prairie coneflower	Ratibida columnifera	5
Western yarrow	Achillea millefolium lanulosa	5
Purple prairie clover	Petalostemon purpureum	3
White prairie clover	Petalostemon candidum	2

INDIGENOUS TREES AND SHRUBS FOR REVEGETATION

Common Name	Scientific Name
Box elder	Acer negundo
Silver sagebrush	Artemisia cana
Big sagebrush	Artemisia tridentata
Rubber rabbitbrush	Chrysothamnus nauseosus
Green rabbitbrush	Chrysothamnus viscidiflorus
Fleshy hawthorn	Crataegus succulenta
Green ash	Fraxinus pennsylvanica
Rocky Mountain juniper	Juniperous scopulorum
Ponderosa pine	Pinus ponderosa
Narrow leaf cottonwood	Populus angustifolia
Plains cottonwood	Populus deltoides
American plum	Prunus americana
Chokecherry	Prunus virginiana
Skunkbush sumac	Rhus trilobata
Golden current	Ribes aureum
Squaw current	Ribes cereum
Redshoot gooseberry	Ribes setosum
Woods rose	Rosa woodsii
Peachleaf willow	Salix amygdaloides
Tealeaf willow	Salix phylicifolia
Western snowberry	Symphoricarpos occidentalis
Buffalo berry	Sheperdia argentea
Yucca	Yucca glauca

APPENDIX G-1.--Vegetative habitat types associated with various wildlife species in the Colstrip area

Species	Existing Vegetative Habitat Types[1]	Proposed Postmining Habitat Types[2]
Mule Deer (Odocoileus hemionus)	211, 212.1, 212.2, 213, 351, 352	1, 3, 4, 5, 6, 7, 8, 9, 10, 11
Pronghorn Antelope (Antilocapra americana)	111.2, 111.3, 111.4, 211, 212.1, 212.2	2, 4, 5, 6, 7, 8, 11, 12, 13
Sharp-tailed Grouse (Pedioecetes phasianellus)	111.2, 111.3, 111.4, 211, 212.1, 212.2, 213	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Sage Grouse (Centrocercus urophasianus)	211, 212.1, 212.2	4, 5, 6, 7, 8, 11
Hungarian Partridge (Perdix perdix)	111.2, 111.3, 111.4, 211, 212.1, 212.2, 213, 351, 352	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Merriam's Turkey (Meleagris gallopavo merriami)	351, 352	1
Raptors	351, 352, S	1, S

[1]Existing (premining) vegetative habitat types and code numbers (Ecological Consulting Service, 1975):

111.2	Agropyron smithii--Koelaria cristata--Carex filifolia
111.3	Stipa comata--Carex filifolia--Koelaria cristata
111.4	Calamovilfa longifolia--Andropogon spp.
211	Artemesia tridentata--Koelaria cristata--Agropyron spicatum
212.1	Artemesia cana--Agropyron smithii--Stipa viridula--Bromus spp.
213	Rhus trilobata--Stipa comata--Agropyron smithii
351	Pinus ponderosa--Agropyron spicatum
352	Pinus ponderosa--Juniperus scopulorum--Agropyron spicatum
S	Sandstone outcrops

[2]Proposed postmining vegetative habitat types and code numbers. Appendix F-1 shows composition of seed, tree, and shrub mixtures.

1 Pinus ponderosa--Rhus trilobata
2 Lowland drainage mixture--supplemental mixture--selected lowland mixture
3 Rhus trilobata--steep upland mixture--supplemental mixture
4 Artemesia cana--upland mixture--supplemental mixture
5 Artemesia tridentata--lowland drainage mixture--supplemental mixture--selected lowland trees and shrubs from a list of indigenous trees and shrubs
6 Artemesia cana--steep upland mixture--supplemental mixture
7 Artemesia cana--lowland drainage mixture--supplemental mixture--selected lowland trees and shrubs from a list of indigenous trees and shrubs
8 Artemesia tridentata--steep upland mixture--supplemental mixture
9 Rhus trilobata--lowland drainage mixture--supplemental mixture--selected lowland trees and shrubs from a list of indigenous trees and shrubs
10 Rhus trilobata--upland mixture--supplemental mixture
11 Artemesia tridentata--upland mixture--supplemental mixture
12 Upland mixture--supplemental mixture
13 Steep upland mixture--supplemental mixture
S Sandstone outcrops

APPENDIX I-1.-- Disposition of the coal severance tax collection according to 15-35-108,MCA

[Data are in percent of total collection]

	July 1, 1977 to June 30, 1979	July 1,1979 to December 31,1979	January 1,1980 to next change
Constitutional trust fund	25.0	25.0	50.0
General fund	30.0	28.875	19.0
Local impact and education trust fund	19.875	28.125	18.75
Coal area highway improvement	9.75	0.0	0.0
State public school equalization	7.5	7.5	5.0
Alternative energy research, development and demonstration	1.875	1.875	2.5
Renewable resource development bond account (sinking fund)	1.875	1.875	1.25
Parks and art	1.875	3.75	2.5
Producing county	1.5	1.5	0.0
County planning (statewide)	0.75	0.75	0.5
State library commission	0.0	0.75	0.5
Total	100.0	100.0	100.0

APPENDIX I-2.--Summary of the cost to the consumer of the Montana severance tax, 1979

Utility	Quantity[1] (1000s tons)	Cost of Montana Coal Dlvrd[1]	f.o.b.[2]	C.S.P.[3]	Sev Tax per ton[4]	Sev Tax paid	Residential % of Total Kwh Sales[5]	Avg # of Residential Customers[5]	Cost per Residential Customer
Central Illinois Light	686.9	$27.89	$11.57	$ 8.08	$2.42	$ 1,662,000	31.3	163,455	$3.18
Commonwealth Edison	4,185.2	33.62	15.83	11.28	3.38	14,146,000	27.7	2,676,826	1.46
Detroit Edison	2,500.0	26.17	13.36	9.45	2.84	7,100,000	27.8	1,603,624	1.23
Interstate Power	247.4	24.46	7.97	5.49	1.65	408,000	20.8	108,855	0.78
Lower Colorado River Auth.	804.5	35.55	17.43	12.47	3.74	3,008,000	4.6	16,566	8.35
Minnesota Power & Light	2,783.6	17.68	7.84	5.50	1.65	4,600,000	8.0	91,422	4.03
Montana Dakota Utlities	303.9	10.33	10.33	6.704	1.34	380,082	47.8	86,721	2.09
Montana Power Company	1,942.5	5.75	5.48	3.72	1.12	2,168,000	22.5	187,701	2.60
Northern States Power	8,348.2	16.51	5.50	3.73	1.12	9,350,000	24.4	949,499	2.40
Puget Sound Power & Light	1,231.0	6.28	6.28	4.30	1.29	1,588,000	56.9	458,220	1.76
Wisconsin Power & Light	2,064.6	15.12	6.44	4.41	1.32	2,725,000	38.8	259,550	4.07

[1]Delivered cost. Source: U.S. Department of Energy 1980, Form 423 summary, unpublished printout.
[2]f.o.b., freight on board, delivered cost less estimated transportation charges.
[3]C.S.P., contract sales price, fob=CSP + 0.3CSP[a] + 0.005CSP[b] + (0.45)(CSP)(Mill levy)[c] + $0.35[d] + 0.02 f.o.b.[e]
[4]30 percent of CSP.
[5]Source: Uniform Statistical Report for year ended December 31, 1979.
[a]Montana Severance Tax.
[b]Resource Indemnity Trust Tax.
[c]Gross Proceeds (local ad valorem property tax).
[d]Federal Abandoned Mine Reclamation Fee.
[e]Federal Black Lung Tax, has an upper limit of $0.25 per ton.

APPENDIX I-3.--Method for calculating the effect of the pending Federal royalty increase on the contract sales price of Area E coal and the cost of Montana Power Company's residential electricity

The net effect of royalty increase was estimated in the following fashion:

F.O.B. - Federal royalty - black lung excise tax = Federal base
Substituting 1979 Area E prices this becomes:
$5.48 - $0.15 - $0.11 = $5.48 - $0.26 = $5.22

When Section 2 is mined, the provisions of lease M 035735 go into effect and the royalty goes to 23 percent of F.O.B. The black lung excise tax remains at 2 percent of F.O.B. Therefore,

$$\text{F.O.B.} = \frac{\text{Federal base}}{.77} = \frac{\$5.22}{.77} = \$6.779$$

and so Federal royalty and black lung = $1.559 [.23($6.779)].

This causes an increase in the F.O.B. price of $1.299 ($1.559-0.26).

Production taxes then go up by .348 of the initial increase or $0.452.

Federal royalty and black lung excise tax increase by .23 of the production tax increase or $0.104.

The process continues, until the increase is less than $0.001 and results in a total F.O.B. increase of $1.903.

Summary of increases:

initial increase	$1.299
1.299 x .348 =	0.452
0.452 x .230 =	0.104
0.104 x .348 =	0.036
0.036 x .230 =	0.008
0.008 x .348 =	0.003
0.003 x .230 =	0.001
0.001 x .348 =	0.000
	$1.903

Hence the F.O.B. price becomes:

$5.480
+ 1.903
$7.383

The contract sales price is determined using the equation:

$$CSP = FOB - 0.35^{a} - (0.02)FOB^{b} - (0.3)CSP^{c} - (0.005)CSP^{d} - (0.043)CSP^{e}$$

or

$$1.348\ CSP = .98\ FOB - 0.35, \text{ and so}$$

$$CSP = \frac{(.98)\ (7.383) - 0.35}{1.348} = \$5.108$$

[a] Abandoned mine reclamation tax
[b] Black lung excise tax (has an upper limit of $0.25 per ton)
[c] Montana Severance Tax
[d] Montana Resource Indemnity Trust Tax
[e] Local property taxes (Gross Proceeds)--assumes a 95-mill levy

CHAPTER VI

REFERENCES

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CHAPTER VII

CONSULTATION AND COORDINATION

A. DEVELOPMENT OF THIS STATEMENT

The following individuals, agencies, and companies (other than those cited in the text) provided information used to analyze Western Energy Company's proposed permit amendment for Area E.

Government Agencies

Action for Eastern Montana (Miles City)

Montana Bureau of Mines and Geology (Butte)

Montana Department of Community Affairs:
Community Development Division (Helena)

Montana Department of Fish, Wildlife, and Parks (Helena)

Montana Department of Health and Environmental Sciences:
Water Quality Bureau (Helena)

U.S. Department of Agriculture:
Soil Conservation Service (Forsyth)

U.S. Department of the Interior:
Bureau of Indian Affairs (Billings)
Bureau of Land Management (Billings and Miles City)
Geological Survey, Water Resources Division (Helena)

Nongovernment

Dwight J. Bergeron, Wildlife Biologist, Independent Contractor with the Department of State Lands, EIS Team

Hydrometrics (Helena)

Gene Kurtz, Mayor of Forsyth and Elementary School Principal

John Shorthill, Rosebud County Emergency Services Coordinator (Forsyth)

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The Department appreciates the assistance of Sherry Schwend, permit coordinator for Western Energy Company, who provided the EIS team with information and arranged visits to the minesite.

B. REVIEW OF THIS STATEMENT

A preliminary version of this EIS was reviewed by the Department of State Land's Reclamation Division, the Department's Environmental Administrator, and the Commissioner of State Lands.

In accordance with the department's regulations governing environmental impact statements (EIS's), copies of the draft EIS were made available to the public for comments and suggestions. The comments received by DSL and the department's responses appear in chapter IV of this EIS. All comments received were carefully considered in the preparation of the final EIS.

The draft and final statements are available for review in the following places:

- Montana Department of State Lands, 1625 11th Avenue, Helena, Montana
- Big Horn County Public Library, 419 North Custer Ave., Hardin, Mont.
- Miles City Public Library, 1 South 10th, Miles City, Mont.

- The Rosebud County Library, 201 North 9th Ave., Forsyth, Mont.
- Parmley Billings Public Library, 510 North Broadway, Billings, Mont.
- Sheridan County Fulmer Public Library, 320 North Brooks, Sheridan, Wyoming.

A limited number of copies are available on request from the Department of State Lands, Capitol Station, Helena, MT 59620.

400 copies of this public document were published at an estimated cost of $4.22 per copy, for a total cost of $1,688.20, which inlcudes $1,008.20 for printing and $680.00 for distribution.

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